ROAD SAFETY AUDIT

Blue Hill Avenue (Route 28) and Warren Street
High Crash Locations

City of Boston

November 1, 2016

Prepared For:
MassDOT Highway Division

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Project Data

A Road Safety Audit for High Crash Locations along Blue Hill Avenue (Route 28) and Warren Street in the Mattapan and Roxbury sections of the City of Boston was held on September 14, 2016 at Station B-3 of the Boston Police Department. The audit specifically focused on the intersections of Blue Hill Avenue at Baird Street and Woodrow Avenue, Blue Hill Avenue at Balsam Street and Johnston Road, Blue Hill Avenue at Harvard Street and Talbot Avenue, and Warren Street at Quincy Street and Townsend Street. As indicated in Table 1, the audit team consisted of representatives from State and Local agencies and included a cross-section of engineering, planning, and emergency response expertise.

Table 1. Participating Audit Team Members

Audit Team Member	Agency/Affiliation
Bonnie Polin	MassDOT Highway Division – Safety Section
Chris Falcos	MassDOT Highway Division – Safety Section
Kush Bhagat	MassDOT Highway Division – Safety Section
Elsa Chan	MassDOT Highway Division – Safety Section
Dorothea Hass	WalkBoston
Martin Harrison	Boston Police Department
Lt. Bill Lessard	Boston EMS
Ruth Georges	ONS – Mayor's Office
Carl McKenzie	Boston Transportation Department
Greg Lucas	BETA Group, Inc.
Justin Curewitz	BETA Group, Inc.

Background

The Federal Highway Administration defines a Road Safety Audit (RSA) as the formal safety examination of an existing or future road or intersection by an independent, multidisciplinary team. The purpose of an RSA is to identify potential safety issues and possible opportunities for safety improvements considering all roadway users. A Road Safety Audit was scheduled for High Crash Locations along Blue Hill Avenue (Route 28) and Warren Street in Boston because fifteen intersections along the corridor are scheduled to be included in a traffic signal improvements project (MassDOT File No. 606134). Six of the fifteen locations include full or partial reconstruction efforts, and four of those six locations meet the region-wide threshold for high crash locations based on their equivalent property damage only (EPDO) score. The RSA specifically focused on these four locations - Blue Hill Avenue at Baird Street and Woodrow Avenue, Blue Hill Avenue at Balsam Street and Johnston Road, Blue Hill Avenue at Harvard Street and Talbot Avenue, and Warren Street at Quincy Street and Townsend Street. The RSA is intended to identify potential short and long term safety improvements that can be made at each intersection, which can then be implemented through general maintenance for short term low cost improvements or incorporated into the future project to the greatest extent practicable.

Project Description

Blue Hill Avenue (Route 28), shown in Figure 1, is an Urban Principal Arterial from Morton Street to Seaver Street, and an Urban Minor Arterial north of Seaver Street. Blue Hill Avenue is a major north-south connector through Roxbury and Dorchester that runs from Mattapan, past Franklin Park, north towards Melnea Cass Boulevard. Warren Street, shown in Figure 2, is an Urban Minor Arterial that branches west from Blue Hill Avenue and is also a north-south connector extending to Dudley Square.

Land use in the project area is a mix of commercial and residential. The Blue Hill Avenue and Warren Street corridors are vital to commuters and to the economic welfare of the community.

The four focus intersections are discussed in detail below.

Blue Hill Avenue at Baird Street and Woodrow Avenue

Blue Hill Avenue, Baird Street and Woodrow Avenue form a four-legged intersection under traffic signal control. Woodrow Avenue is classified as an Urban Collector, while Baird Street is a local road. All roadways are under City jurisdiction. Blue Hill Avenue is a median-divided boulevard-style roadway.

Blue Hill Avenue carries three travel lanes north from Morton Street towards Baird Street and Woodrow Street, as well as a marked bike lane and a parking lane. The dedicated bike lane ends approximately 130 feet in advance of the intersection, and shared accommodation for bicycles is provided within the outside travel lane approaching the northbound stop line. The outside travel lane has constrained width at the stop line due to the curb extension on the southeast corner of the intersection, and does not continue beyond the intersection, requiring northbound through vehicles utilizing this lane to merge within the intersection.

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Figure 1

Location Map -
Blue Hill Avenue

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Figure 2

Location Map - Warren Street

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The southbound Blue Hill Avenue approach provides two travel lanes, a bike lane, and a parking lane. The travel lanes and bike lane are continuous on the departure side of the intersection. No exclusive turn lanes are provided on Blue Hill Avenue at Baird Street and Woodrow Avenue, and turning movements are accommodated from shared lanes. Baird Street provides one-way westbound travel departing the intersection, with parking allowed on both sides of the roadway. Woodrow Avenue provides two-way travel with adjacent parking, although no lane markings are provided.

Blue Hill Avenue at Baird St/Woodrow Ave (looking north)

The four phase traffic signal operates with a leading, pre-timed, protected southbound left turn phase; a north-south through phase; a push-button actuated, exclusive pedestrian phase and an actuated westbound vehicle phase. Continuous sidewalks are provided along both sides of Blue Hill Avenue and both intersecting side streets. Crosswalks are provided across all four approaches. Crosswalks across Blue Hill Avenue do not consistently provide ADA-compliant ramps, and median noses on both approaches interrupt the crosswalk with no ramps or pass-through provided. The intersection experiences a significant amount of pedestrian activity due to the number of businesses and the presence of MBTA bus stops along Blue Hill Avenue. A stop is located northbound departing the intersection. Blue Hill Avenue carries MBTA Route 28, which is a significant arterial transit route between Mattapan Station, Silver Line connection at Dudley Station, and Orange Line connection at Ruggles Station; and MBTA Route 29, which travels between Mattapan Station and Ruggles Station via Blue Hill Avenue and Seaver Street.

Crash data obtained from the Boston Police Department (BPD) show 24 crashes occurred at the intersection for the three year period from 2012 through 2014. A crash data summary and a collision diagram are included in the Appendix. A review of crash data reveal five crashes where a driver struck a parked car – three on Baird Street, one on Blue Hill Avenue southbound, and one on Woodrow Avenue westbound. Two crashes involved a vehicle striking the pedestrian signal post on the southeast corner of the intersection, and one involved a vehicle striking a signal post on the northeast corner. Two crashes involved pedestrians; one was a driver heading westbound in the late afternoon who claimed solar glare as a contributing factor, the other was a driver heading north who struck a pedestrian that was outside of the crosswalk. There were six angle crashes in the center of the intersection, including three between a southbound left turning vehicle and a northbound through vehicle, two between a southbound and westbound vehicle, and one between a northbound left turning vehicle and a southbound through vehicle. The Equivalent Property Damage Only (EPDO) rating of the intersection is 72, which is above the threshold established for high crash locations within the region. The EPDO rating is a weighted system

where fatal crashes are weighted 10 times and injury crashes are weighted 5 times. Twelve of the 24 crashes involved an injury. There were no fatal crashes in the three year study period.

Crash data provided by Boston EMS at the audit indicated two crashes involving motor vehicles at the intersection for 2016 to date. It should be noted that EMS data includes crashes that EMS responds to, and may not include all crashes that occur at the intersection.

The intersection is also part of a pedestrian high crash cluster based on data from 2004 through 2013. The cluster area includes the signalized intersections of Blue Hill Avenue at Morton Street, Blue Hill Avenue at Baird Street and Woodrow Avenue, and Blue Hill Avenue at Balsam Street and Johnston Road. It should be noted that data from 2005 through 2014 does not identify a pedestrian high crash cluster in this area.

Speed regulations maintained by MassDOT Highway Division establish a 25 MPH speed limit for Blue Hill Avenue in the vicinity of the intersection. Speed regulations along Blue Hill Avenue are illustrated in Figure 3, and complete speed regulations are included in the Appendix.

Blue Hill Avenue at Balsam Street and Johnston Road

Blue Hill Avenue, Balsam Street and Johnston Road form a four-legged intersection under traffic signal control. Blue Hill Avenue continues as a median-divided boulevard-style roadway through its intersection with Balsam Street and Johnston Road, which are both classified as local roads.

Blue Hill Avenue provides two travel lanes in each direction through the intersection, along with a marked bike lane and a parking lane. Balsam Street and Johnston Road are both one-way roadways approaching Blue Hill Avenue; as such, no turns are made from Blue Hill Avenue. Balsam Street and Johnston Road both provide a single travel lane approaching the intersection, with parking allowed on both sides of the roadway.

Blue Hill Avenue at Balsam St/Johnston Rd (looking west)

The three phase traffic signal operates with a north-south vehicle phase; a push-button actuated, exclusive pedestrian phase and an actuated east-west vehicle phase. Continuous sidewalks are provided along both sides of Blue Hill Avenue and both intersecting side streets. Crosswalks are provided across all four approaches. Crosswalks across Blue Hill Avenue do not consistently provide ADA-compliant ramps, and median noses on both approaches interrupt the crosswalk, with ramps provided to access the concrete area at the nose of the island. The intersection experiences a significant amount of pedestrian activity due to the number of businesses and the presence of an MBTA bus stop on Blue Hill Avenue southbound departing the intersection.

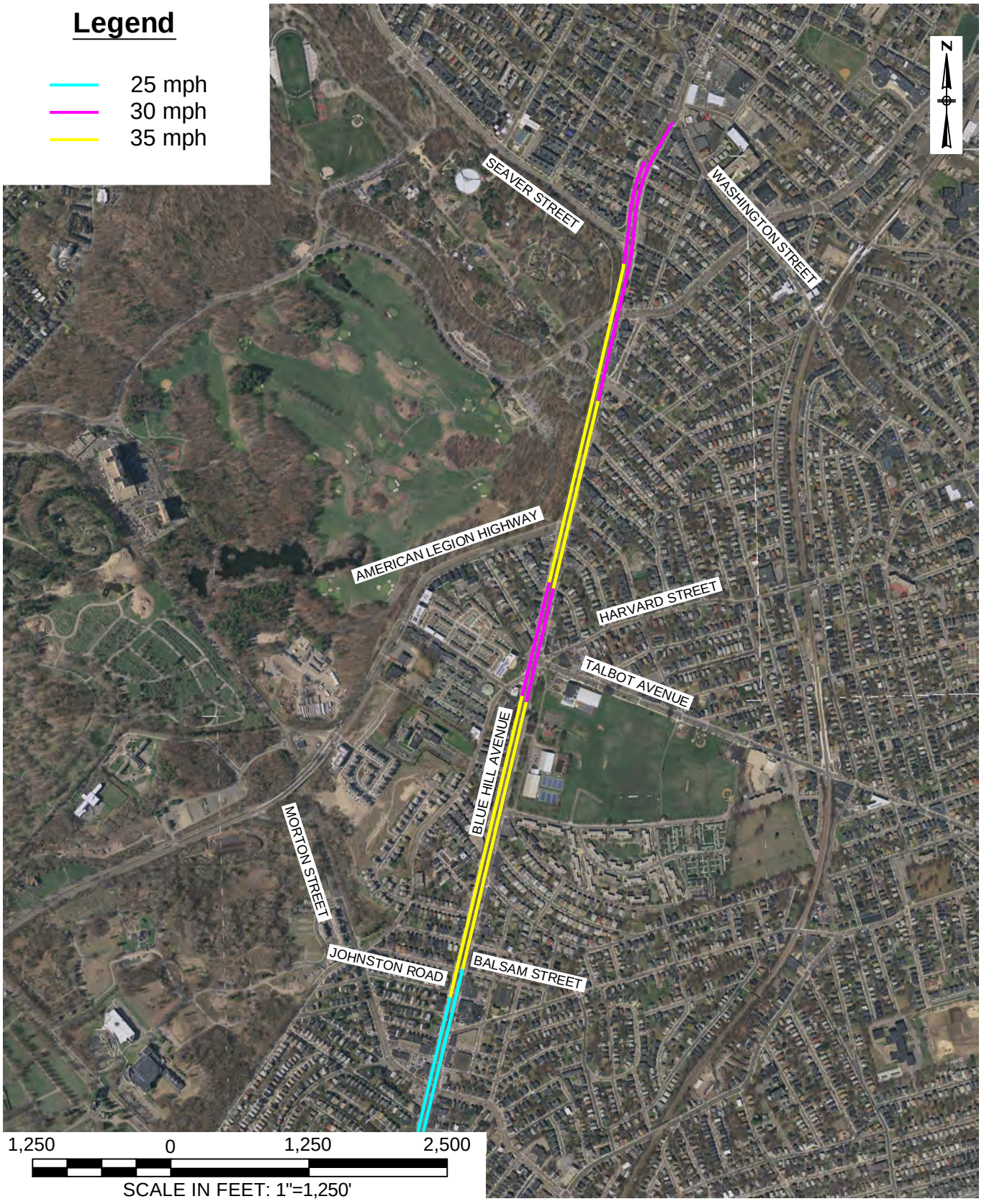

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Figure 3

Blue Hill Avenue
Speed Regulation #193

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Crash data obtained from the Boston Police Department (BPD) show seven crashes occurred at the intersection for the three year period from 2012 through 2014. The resultant EPDO rating for the intersection is 15, which is below the threshold for high crash locations within the region; however, the intersection is included in the pedestrian high crash cluster extending north from Morton Street based on data from 2004 through 2013.

A crash data summary and a collision diagram are included in the Appendix. Only four of the seven crashes are able to be mapped on the collision diagram. Two of these four mapped crashes involved pedestrians; one was a pedestrian that crossed when they did not have the walk signal after departing a bus, the other was a crash at night involving a driver who was not using their headlights. A bicycle crash also occurred at the intersection where a vehicle making an illegal U-turn southbound struck a bicyclist. The fourth mapped crash was a southbound rear-end crash.

Crash data provided by Boston EMS at the audit indicated one crash involving motor vehicle(s) at the intersection for 2016 to date. As previously noted, EMS data includes crashes that EMS responds to, and may not include all crashes that occur at the intersection.

Blue Hill Avenue at Harvard Street and Talbot Avenue

Blue Hill Avenue, Harvard Street and Talbot Avenue form a complex intersection under traffic signal control. The intersection is comprised of two offset intersections with Blue Hill Avenue forming the north-south leg of both intersections. Blue Hill Avenue continues as a median-divided boulevard-style roadway through the intersection. Harvard Street intersects from the west at the southern intersection and Talbot Avenue and Harvard Street intersect Blue Hill Avenue at the northern intersection from the southeast and northeast, respectively. Harvard Street and Talbot Avenue are both classified as Urban Minor Arterials under City of Boston jurisdiction.

Blue Hill Avenue at Harvard Street and Talbot Avenue (looking north)

Blue Hill Avenue northbound provides a left turn lane and two through lanes approaching the southern intersection of Harvard Street. The two through lanes and an adjacent bike lane continue through both intersections. A northbound right turn lane for turns to both Talbot Avenue and the eastern leg of Harvard Street begins immediately north of the southern intersection; however, vehicles were observed using the bus stop and shoulder approaching the intersection to bypass queued vehicles and access the right turn lane.

Blue Hill Avenue southbound provides a left turn lane and three through lanes approaching the northern intersection. The outside through lane becomes a right turn lane to the western leg of Harvard Street after passing through the northern intersection. A bike lane is provided on Blue Hill Avenue southbound approaching the intersection, but ends at the beginning of the three lane section. Shared accommodation for bicycles is provided southbound through the intersection.

The west leg of Harvard Street provides a single approach and departure lane separated by a small raised median island. The east leg of Harvard Street also provides a single approach and departure lane, with parking on the south side only. The Talbot Avenue leg provides a single departure lane and two approach lanes. Right turns from Talbot Avenue to Harvard Street eastbound are accommodated by a triangular channelizing island.

The multi-phase traffic signal operates with quad-left phasing on Blue Hill Avenue; an actuated and protected vehicle phase serving Talbot Street; a push-button actuated, exclusive pedestrian phase and an actuated vehicle phase serving both Harvard Street approaches. Continuous sidewalks are provided along both sides of all intersecting roadways. Crosswalks are provided across Blue Hill Avenue on both sides of the northern intersection, and across both legs of Harvard Street and across Talbot Avenue. No crosswalk is provided across Blue Hill Avenue at the southern intersection with Harvard Street. MBTA bus stops are provided on Blue Hill Avenue approaching the intersection in both the northbound and southbound direction.

Crash data obtained from the Boston Police Department (BPD) show 46 crashes occurred at the intersection for the three year period from 2012 through 2014. A crash data summary and a collision diagram are included in the Appendix. Only 25 of the 46 crashes were able to be mapped on the collision diagram. The most prevalent crash type were rear-end crashes, comprising 48% of total crashes. Rear-end crashes occurred on both Blue Hill Avenue approaches, on the Talbot Avenue approach and on the Harvard Street eastbound approach. Of particular interest are two crashes where a vehicle struck the nose of the island on the west leg of Harvard Street when turning left to Harvard Street. Also notable are two head-on angle crashes involving vehicles turning right onto the east leg of Harvard Street. One third of the crashes occurred between 10 PM and 6 AM.

One pedestrian crash and two bicycle crashes occurred at the intersection in the study period. The pedestrian crash involved a driver striking a pedestrian in the crosswalk when the driver had the green light. One bicycle crash involved a vehicle turning right towards Harvard Street striking a bicyclist, while the other involved a bicyclist who crossed Talbot Avenue between queued cars and was struck by a vehicle departing the intersection.

The EPDO rating for the intersection is 98, which far exceeds the regional threshold for a high crash location. Crash data provided by Boston EMS at the audit indicated eight crashes involving motor

vehicles and two crashes involving pedestrians at the intersection for 2016 to date. As previously noted, EMS data includes crashes that EMS responds to, and may not include all crashes that occur at the intersection.

Warren Street at Quincy Street and Townsend Street

Warren Street, Quincy Street and Townsend Street form a four-legged intersection under traffic signal control. All three streets are Urban Minor Arterials under City of Boston jurisdiction.

Warren Street changes character in the vicinity of this intersection. Warren Street from Blue Hill Avenue north to Quincy Street and Townsend Street provides a single travel lane in each direction, divided by a double yellow centerline. Warren Street north of the intersection to Dudley Square provides two travel lanes in each direction divided by a cement concrete or planted median. The Warren Street northbound approach to Quincy Street and Townsend Street expands to a three lane approach, with a left turn lane and two through lanes. Shared accommodation for bicyclists is provided in the right travel lane, which immediately abuts the curb and has an adjacent bus stop. These factors may cause confusion amongst drivers who may not realize that this is a through travel lane. The southbound Warren Street approach provides a left turn lane and a wide through lane with shared accommodation for bicyclists.

Warren Street at Quincy Street and Townsend Street (looking north)

Quincy Street approaching the intersection provides a shared lane for left turns and through vehicles, and a right turn lane. Townsend Street provides a single approach and departure lane separated by a double yellow center line. The three phase, semi-actuated traffic signal operates with actuated left turn phases on Warren Street; a fixed-time through phase for Warren Street; a push-button actuated, exclusive pedestrian phase; and an actuated vehicle phase for Quincy Street and Townsend Street. Continuous sidewalks are provided on both sides of all intersecting streets. Crosswalks are provided across all four legs of the intersection.

Crash data obtained from the Boston Police Department (BPD) show 26 crashes occurred at the intersection for the three year period from 2012 through 2014. A crash data summary and a collision diagram are included in the Appendix. The most prevalent crash type were rear-end crashes, comprising 42% of total crashes. Rear-end crashes occurred on both Warren Street approaches and on the Quincy Street approach. Of note are three sideswipe crashes on the southbound Warren Street approach, potentially indicating confusion over intended lane assignments. Sideswipe crashes also occurred for vehicles turning from both Quincy Street and Townsend Street.

The EPDO rating for the intersection is 86, which far exceeds the regional threshold for a high crash location. Crash data provided by Boston EMS at the audit indicated six crashes involving motor vehicles and two crashes involving pedestrians at the intersection for 2016 to date. As previously noted, EMS data includes crashes that EMS responds to, and may not include all crashes that occur at the intersection.

Audit Observations

Following a brief introduction to the RSA process and a summary of existing geometry and crash information, the audit participants were asked to discuss safety issues at the study intersections. Audit participants then conducted a site visit as a group to each intersection, at which time they offered observations on safety issues and concerns. A summary of those major safety considerations is as follows:

Blue Hill Avenue at Baird Street and Woodrow Avenue

- Pedestrian Accommodations – Several items related to pedestrian accommodations were noted as safety issues.
    - Pedestrian signal heads and pushbuttons are provided for pedestrians crossing Blue Hill Avenue, but are not provided for pedestrians crossing Baird Street or Woodrow Avenue.
    - The nose of the island on both Blue Hill Avenue legs of the intersection block the crosswalk, and ramps are not provided to allow a wheelchair-bound pedestrian to access the concrete refuge area at the nose of the island.
    - Pedestrian clearance times may be too short to meet current standards.

Island blocks crosswalk and does not provide ramps

- Signal Phasing – The traffic signal provides an advance protected phase for southbound left turning vehicles, but does not provide signage to alert northbound drivers that this advance phase exists. Further discussion amongst audit participants suggests that an advance sign in the opposing direction is uncommon and not required for this application. Crashes between southbound left turning vehicles and northbound through vehicles can be attributed to clearance time violations or to drivers taking chances on unacceptable gaps. A southbound left turning driver must traverse the width of the median and three northbound travel lanes against opposing traffic when turning during the permissive phase.
- Northbound Lane Alignment – The northbound approach provides three through lanes, with the right-most through lane having constrained width due to the curb extension. It was also noted that this third lane does not continue through the intersection, requiring vehicles to merge within the intersection. The location of the curb extension

Curb Extension constrains right through lane

may be a factor in two crashes where a vehicle struck the signal post on the southeast corner, while the lack of a receiving lane is a likely factor in fixed object crashes on the northeast corner of the intersection.

- Signal Equipment – No signal backplates are provided. Backplates provide additional visibility of the signal head against the background vista, which is especially useful when looking at the signal against bright sky. Two crashes cited solar glare as a contributing factor, both involving a westbound vehicle, although one occurred in the morning when the sun is in the east.

- Clearance Times – Yellow and red clearance times were noted to be potentially inadequate. Rear-end and angle crashes at the intersection can be the result of vehicles remaining in the intersection after their phase has ended due to inadequate clearance intervals.

- Parking – It was noted that the defined limits of parking areas may be too close to the intersection, which may be a contributing factor in five crashes involving parked cars. It was also suggested that vehicles park outside of the defined limits. Audit participants specifically focused on the handicap parking space established on the north side of Baird Street. This zone begins less than 10 feet beyond the crosswalk, in violation of the Manual on Uniform Traffic Control Devices (MUTCD), which requires 20 feet between a crosswalk and the beginning or end of a parking zone. It was also noted that a delivery driver for a nearby pizza shop regularly parks partially within or behind this handicap zone, resulting in even further encroachment on the intersection.

Handicap Parking Zone close to crosswalk

- Pavement Markings - Markings are generally faded at the intersection. This reduces adherence and can create confusion over intended lane assignments, and reduces visibility and awareness of pedestrian crossings.

- Bus Stops – It was noted that the bus stop on the northbound departure side of the intersection has signage indicating two separate stops. The bus stop pavement markings extend 125 feet across a commercial driveway entrance. As previously noted, the Blue Hill Avenue corridor is a heavily-traveled transit route. Audit participants discussed the possibility that the extended length of the bus stop is to allow more than one bus to stop at once.

- Flashing Operation – This signalized intersection operates on overnight flash. The audit team discussed the merits of overnight flash and concluded that full-time stop and go operation is appropriate for this corridor. 21% of crashes occurred between midnight and 6 AM. This item applies to all intersections included in the project.

Blue Hill Avenue at Balsam Street and Johnston Road

- Pedestrian Accommodations – Several items related to pedestrian accommodations were noted as safety issues.

- Pedestrian signal heads and pushbuttons are provided for pedestrians crossing Blue Hill Avenue, but are not provided for pedestrians crossing Balsam Street or Johnston Road.

- The nose of the island on both Blue Hill Avenue legs of the intersection blocks the crosswalk. Ramps are provided to allow access to the concrete refuge area, but are not consistently aligned with the crosswalk.

- Pedestrian clearance times may be too short to meet current standards.

- Turning Vehicles – Balsam Street and Johnston Road are both one-way towards the intersection, which means that no turning movements are necessary from Blue Hill Avenue at this intersection. U-turns at this intersection are not specifically prohibited by signage, but u-turning vehicles could be unexpected and could result in rear-end or angle crashes. The one bicycle crash identified at this intersection involved a southbound U-turn vehicle.

- Street Lighting – It was noted that lighting may not be adequate at the intersection. Overhead lights are provided on both sides of Blue Hill Avenue on the north side of the intersection, but are not provided on the south side of the intersection. It should be noted that one pedestrian crash occurred at night on the lighted north side of the intersection.

- Bus Stops – A bus stop is located on the southbound departure side of the intersection. Audit participants suggested that bus stop locations and pedestrian facilities need to be carefully considered so that facilities provide safe accommodations for transit riders. A pedestrian crash at this location involved a person who had just departed a bus, although the crash details suggest that the pedestrian crossed against a green light for opposing traffic.

- Speed Limits – Speed limit signs are not consistently posted near the intersection and along the corridor.

Blue Hill Avenue at Harvard Street and Talbot Avenue

- Pedestrian Accommodations – Several items related to pedestrian accommodations were noted as safety issues.

  - Pedestrian signal heads do not provide countdown intervals.

  - Pedestrian intervals are not long enough to meet current standards. The intersection is designed for single stage crossings of each leg of the intersection, but the length of the pedestrian interval may cause pedestrians to cross in two stages.

  - The nose of the island on the north leg of Blue Hill Avenue and on the west leg of Harvard Street partially blocks the crosswalk. Ramps

Island nose partially blocks crosswalk

are not provided to allow access to the island, although a pedestrian pushbutton is provided for the Blue Hill Avenue leg.

- Pedestrians crossing multiple legs of the intersection must wait through multiple cycles to utilize the exclusive pedestrian phase for each crossing stage of their intended path. This can take up to five minutes given the signal cycle length. While only one crash was recorded involving pedestrians, this condition could lead to impatience amongst pedestrians and could encourage pedestrians to choose to cross without the WALK signal.

- A pedestrian crossing is not provided on the southern leg across Blue Hill Avenue. The MBTA bus stop is located on the east side of the southern intersection; passengers wishing to cross Blue Hill Avenue must cross multiple legs of the intersection.

- Islands – Issues related to the island configuration, vehicle paths and signage were noted as safety concerns as evidenced by vehicles striking islands.

  - U-turns at this intersection are not specifically prohibited by signage, but u-turning vehicles could be unexpected and could result in rear-end or angle crashes.

  - As noted above, the island on the west leg of Harvard Street partially blocks the crosswalk. This island also lacks signage or other vertical elements and may not be clearly visible to drivers, which may be contributing factors in angle crashes where northbound turning vehicles strike the island.

  - The channelizing island separating the east legs of Harvard Street and Talbot Avenue may cause vehicles turning towards Harvard Street to make a wide turn, creating a conflict with westbound vehicles which may be a contributing factor in two head-on crashes on this leg of the intersection.

  - The R4-7 (Keep Right) sign on the south nose of the Blue Hill Avenue median island between the two intersections is mounted below the 4-foot minimum height required by the MUTCD. This reduced height reduces visibility of the sign, and may reduce visibility and awareness of the islands. Two crashes involved northbound vehicles striking this island.

- Lane Use – Several concerns related to lane use were identified as safety issues.

  - The northbound Blue Hill Avenue approach provides a bike lane and a curbside parking lane approaching the intersection. The parking lane ends approximately 200 feet in advance of the northbound stop line to accommodate a bus stop for 120 feet, with the last 80 feet featuring cross hatch markings to reinforce a no parking zone. Drivers use the bike lane and the cross hatch area to bypass the northbound queue and directly access the right turn lane which is provided between the two intersections to access the east legs of Harvard Street and Talbot Avenue. A driver was observed using this area on the day of the audit.

  - It was also noted that drivers use the northbound right turn lane between the two intersections as a through lane, cutting back into the through lane while passing through the intersection. No

crashes appear to be attributable to this issue, and audit participants suggested that this behavior had become less prevalent following recent modifications to the intersection.

- It was suggested that the single lane approach of Harvard Street eastbound traps right-turning vehicles in the queue with vehicles waiting to turn left onto Blue Hill Avenue or continue to the east leg of Harvard Street or Talbot Avenue. Traffic counts collected in 2016 show five or fewer vehicles turning right from Harvard Street during both the morning and afternoon peak hours.

- The Talbot Avenue approach provides two lanes, likely intended as a left and right turn lane, although no lane markings or lane designation signage is provided. A sideswipe crash on this approach may be related to confusion over intended lane assignments.

- Signal Control – The driveway for the tire shop on the west side of the intersection is in the center of the northern intersection but does not have signal control. It should be noted that the MUTCD does not require signalization for this condition, and that no crashes appear to be attributable to this issue.

- Pavement Markings – Markings are faded at this intersection, especially on the Talbot Avenue approach. This reduces adherence and can create confusion over intended lane assignments

- Parking – It was noted that the defined limits of parking areas may be too close to the crosswalk. It was also suggested that vehicles park outside of the defined limits.

Warren Street at Quincy Street and Townsend Street

- Northbound Lane Configuration – The northbound approach provides a left turn lane and two through lanes; however, the right through lane is immediately adjacent to the curb and is narrow, and may appear to be a parking lane. Further exacerbating this issue is a bus shelter and bus stop established within the lane, and a "sharrow" marking indicating shared accommodation for bicycles. Drivers may assume that this is a bus stop and/or a bike lane and not a lane for vehicles, although dotted markings through the intersection suggest a continuation of the lane as a through lane on the northbound departure side of the intersection.

Southbound Lane Trap

- Southbound Lane Trap – Warren Street southbound provides two travel lanes, with the left lane becoming a left turn lane at the intersection. An R3-7L "Left Lane Must Turn Left" sign and arrow and "ONLY" pavement markings are provided; however, three sideswipe crashes suggest driver confusion over intended lane assignments.

- Queueing – It was noted by audit participants that southbound queues sometimes extend back to Martin Luther King, Jr. Boulevard, a distance of approximately 530 feet. Traffic congestion can lead to driver frustration and can be a factor in both rear-end and angle crashes at the intersection.

Northbound lane approach with bus stop

- U-Turns – U-turns at this intersection are not specifically prohibited by signage, but would be unexpected and could result in rear-end or angle crashes and conflicts with bicyclists.

- Signage – Audit participants noted that there is no R10-11 No Turn on Red sign for Townsend Street. A No Turn on Red sign is provided for Quincy Street.

Potential Safety Enhancements

Following review of available materials and a discussion of existing safety issues, audit participants were asked to consider improvements. Audit participants were encouraged to consider both short and long term improvements for each issue. Each improvement considered has been categorized as short-term, mid-term, or long-term based on the definitions shown in Table 2. Additionally, a cost category has been assigned to each improvement based on the parameters set forth in Table 2.

Table 2. Estimated Time Frame and Costs Breakdown

Time Frame		Costs	
Short-term	<1 year	Low	<$10,000
Mid-term	1–3 years	Medium	$10,000–$50,000
Long-term	>3 years	High	>$50,000

Blue Hill Avenue at Baird Street and Woodrow Avenue

- Provide pedestrian signal heads and pushbuttons for the crosswalks across Baird Street and Woodrow Avenue. Pedestrian signal heads should have countdown displays matching current standards. This is a short-term, medium cost improvement.
- Revise islands so that they do not interrupt crosswalks. This can be accomplished by shortening the island so that the crosswalk crosses uninterrupted, or by providing ramps or a level pass-through so that the island provides pedestrian refuge. This is a mid-term, medium cost improvement.
- Update wheelchair ramps to meet current ADA/AAB standards. This is a short-term, medium cost improvement.
- Provide backplates for all signal heads. This is a short-term, low cost improvement.
- Revise pedestrian and vehicle clearance times to meet current standards. This is a short-term, low cost improvement.
- Consider a southbound left turn lane on Blue Hill Avenue. The existing median is wide enough to accommodate widening for a left turn lane while still maintaining an island separating northbound and southbound traffic. This is a mid-term, high cost improvement.
- Revise northbound lane alignment approaching Baird Street and Woodrow Avenue. The right through lane heading northbound is presently constrained by the curb extension, and the three lane section is not continuous through the intersection. Furthermore, the bike lane ends in advance of the intersection, with shared accommodation provided within the three lane approach. It is recommended to transition to a two lane section on the northbound approach and maintain a continuous bike lane approaching the intersection. This is a short-term, low cost improvement that can be accomplished with pavement markings but will be further formalized in conjunction with curb and sidewalk reconstruction as part of the planned project.

- Adjust parking limits to maintain 20 foot minimum clearance next to crosswalks. This is a short-term, low cost improvement.

- Enforce parking limits. This is a short-term improvement, the cost of which is reduced enforcement elsewhere.

- Reapply pavement markings, including crosswalk markings. This will increase adherence to intended lane assignments and increase visibility of crosswalk locations. This is a short-term, medium cost improvement.

- Coordinate with the MBTA on bus stop locations and lengths to determine if consolidation is possible. Consolidation of stops would further define pedestrian desire lines. This is a short-term, low cost improvement.

- Eliminate overnight flashing operation of all traffic signals along the corridor. The number of crashes occurring overnight suggests that traffic signal operation is needed 24 hours a day. This is a short-term, low cost improvement.

Blue Hill Avenue at Balsam Street and Johnston Road

- Provide pedestrian signal head and pushbuttons for the crosswalks across Balsam Street and Johnston Road. Pedestrian signal heads should have countdown displays matching current standards. This is a short-term, medium cost improvement.

- Revise islands so that they do not interrupt crosswalks. This can be accomplished by shortening the island so that the crosswalk crosses uninterrupted, or by providing ramps or a level pass-through so that the island provides pedestrian refuge. This is a mid-term, medium cost improvement.

- Update wheelchair ramps to meet current ADA/AAB standards. This is a short-term, medium cost improvement.

- Revise pedestrian and vehicle clearance times to meet current standards. This is a short-term, low cost improvement.

- Restrict U-turns at the intersection with R3-4 No U-Turn signs. Eliminating U-turns would eliminate unexpected turns and vehicle conflicts during green intervals. This is a short-term, low cost improvement.

- Consider closing the median across the intersection and restricting Balsam Street and Johnston Road to right turns only. This would eliminate the need for a traffic signal, although traffic flow and pedestrian access and would still need to be considered. This is a long-term, high cost improvement.

- Review street lighting, and update if necessary. Lighting should be focused on pedestrian crosswalks. This is a mid-term, potentially medium cost improvement.

- Review bus stop locations and pedestrian accommodations to ensure that pedestrian desire lines are met. This is a short-term improvement that could provide feedback for ramp and sidewalk improvements.

- Update speed limit signage to match speed regulations, and consider "speed check" driver feedback speed limit signs. This is a short-term, medium cost improvement.

Blue Hill Avenue at Harvard Street and Talbot Avenue

- Replace pedestrian signal heads with heads with countdown intervals. This is a short-term, medium cost improvement.

- Revise pedestrian and vehicle clearance times to meet current standards. This is a short-term, low cost improvement.

- Consider concurrent pedestrian phasing. Concurrent phasing could shorten wait time for pedestrians. Concurrent operation needs to be carefully considered against turning volumes. This is a short-term, low cost improvement.

- Reduce size of the cement concrete island on the west leg of Harvard Street. This short-term, medium cost improvement would eliminate the crosswalk obstruction and may reduce occurrences of vehicles striking the island.

- Revise island on the north leg of Blue Hill Avenue so that it does not interrupt the crosswalk. This can be accomplished by shortening the island so that the crosswalk crosses uninterrupted, or by providing ramps or a level pass-through so that the island provides pedestrian refuge. This is a mid-term, medium cost improvement.

- Restrict U-turns at the intersection with R3-4 No U-Turn signs. Eliminating U-turns would eliminate unexpected turns and vehicle conflicts during green intervals. This is a short-term, low cost improvement.

- Provide an R4-7 (Keep Right) sign on the nose of the island on the west leg of Harvard Street. This is a short-term, low cost improvement.

- Reset the R4-7 (Keep Right) sign on the south nose of the Blue Hill Avenue median island between the two intersections. This is a short-term, low cost improvement.

- Reduce size of the island separating the east legs of Harvard Street and Talbot Avenue, if feasible, to facilitate turning movements. This is a mid-term, medium cost improvement that needs to consider pedestrians which presently use the island for refuge when crossing both roadways.

- Review signage and pavement markings for the bike lane, bus stop and no parking area adjacent to the northbound Blue Hill Avenue approach. Proper signage will help discourage drivers who presently use this area to bypass the queue when headed northbound. This is a short-term, low cost improvement.

- Continue enforcement against vehicles improperly using turning lanes and shoulders to bypass queues. This is a short-term improvement, the cost of which is reduced enforcement elsewhere.

- Provide lane designation signage for Talbot Avenue. This is a short-term, low cost improvement.

- Provide signage restricting left turns exiting the unsignalized tire shop driveway on the west side of the intersection. Allowing vehicles to exit the uncontrolled driveway into the center of the intersection can create conflicts with signal control. This is a short-term, low cost improvement.

- Reapply pavement markings, including crosswalk markings. This will increase adherence to intended lane assignments and increase visibility of crosswalk locations. This is a short-term, medium cost improvement.

- Adjust parking limits to maintain 20 foot minimum clearance next to crosswalks. This is a short-term, low cost improvement.

- Enforce parking limits. This is a short-term improvement, the cost of which is reduced enforcement elsewhere.

Warren Street at Quincy Street and Townsend Street

- Improve signage and pavement markings for the bus stop on the Warren Street northbound approach. It may be appropriate to maintain a solid edge line and discontinue use of this lane as a through travel lane. This is a short-term, low cost improvement.

- Consider relocating bus stop to the far side of the intersection. Implementation would require relocation of the bus shelter on the northbound approach. This is a short-term, medium cost improvement.

- Improve signage and pavement markings for the Warren Street southbound left turn lane trap. Traffic counts suggest that the existing lane configuration is appropriate. Current guidelines for thicker dashed markings delineating turn lanes should be applied to alert drivers that the left lane becomes a left turn lane. This is a short-term, low cost improvement.

- Review traffic signal timings to reduce northbound queues. Traffic signal timing improvements will be based on 2016 traffic count data. This is a short-term, low cost improvement.

- Restrict U-turns for the median-divided north leg of the intersection with an R3-4 No U-Turn sign. Eliminating U-turns would eliminate unexpected turns and vehicle conflicts during green intervals. This is a short-term, low cost improvement.

- Determine whether an R10-11 No Turn on Red sign is appropriate for Townsend Street. Restricting turns on red would eliminate potential conflicts with pedestrians during the exclusive pedestrian phase. This is a short-term, low cost improvement.

Summary of Road Safety Audit

Table 3 summarizes potential recommendations discussed by the audit team. The recommendations are categorized based on the potential safety payoff, as well as by time frame and cost. The safety payoff is a qualitative judgment of the effectiveness of the potential safety improvements. Each recommendation has a responsibility assigned to it stating whether MassDOT or the City of Boston would be responsible for implementing the recommended improvement.

Table 3. Potential Safety Enhancement Summary

Safety Issue	Safety Enhancement	Responsibility	Safety Payoff	Time Frame	Cost
Blue Hill Avenue at Baird Street and Woodrow Avenue					
Pedestrian Accommodations	Provide pedestrian signal heads and pushbuttons for the crosswalks across Baird Street and Woodrow Avenue.	City	Medium	Short-term	$20,000
Pedestrian Accommodations	Revise islands so that they do not interrupt crosswalks.	City	Medium	Mid-term	$50,000
Pedestrian Accommodations	Update wheelchair ramps to meet current ADA/AAB standards.	City	Medium	Short-term	$50,000
Signal Equipment	Provide backplates for all signal heads.	City	Medium	Short-term	Low
Pedestrian Accommodations, Clearance Times	Revise pedestrian and vehicle clearance times to meet current standards.	City	Medium	Short-term	Low
Signal Phasing	Consider a southbound left turn lane on Blue Hill Avenue.	City	Medium	Mid-term	$100,000
NB Lane Alignment	Revise northbound lane alignment approaching Baird Street and Woodrow Avenue. End the three lane section in advance of the intersection, and provide a two lane section with bike lane through the intersection.	City	High	Short-term	Low
Parking	Adjust parking limits to maintain 20 foot minimum clearance next to crosswalks.	City	High	Short-term	$5,000
Parking	Enforce parking limits.	City (Police)	High	Short-term	$0 (Reduced enforcement elsewhere)
Pavement Markings	Reapply pavement markings, including crosswalk markings.	City	Medium	Short-term	$15,000
Bus Stops	Coordinate with the MBTA on bus stop locations and lengths to determine if consolidation is possible.	City/MBTA	Low	Short-term	TBD
Flashing Operation	Eliminate overnight flashing operation of all traffic signals along the corridor.	City	Medium	Short-term	Low

Table 3. Potential Safety Enhancement Summary

Safety Issue	Safety Enhancement	Responsibility	Safety Payoff	Time Frame	Cost
Blue Hill Avenue at Balsam Street and Johnston Road					
Pedestrian Accommodations	Provide pedestrian signal heads and pushbuttons for the crosswalks across Balsam Street and Johnston Road.	City	Medium	Short-term	$20,000
Pedestrian Accommodations	Revise islands so that they do not interrupt crosswalks.	City	Medium	Mid-term	$50,000
Pedestrian Accommodations	Update wheelchair ramps to meet current ADA/AAB standards.	City	Medium	Short-term	$50,000
Pedestrian Accommodations	Revise pedestrian and vehicle clearance times to meet current standards.	City	Medium	Short-term	Low
Turning Vehicles	Restrict U-turns at the intersection with R3-4 No U-Turn signs.	City	Medium	Short-term	$500
Turning Vehicles	Consider closing the median across the intersection and restricting Balsam Street and Johnston Road to right turns only	City	High	Long-term	High
Street Lighting	Review street lighting, and update if necessary.	City	Medium	Mid-term	TBD (Medium)
Bus Stops	Review bus stop locations and pedestrian accommodations to ensure that pedestrian desire lines are met.	City/MBTA	Medium	Short-term	TBD
Speed Limits	Update speed limit signs to match speed regulations, and consider “speed check” driver feedback speed limit signs.	City	Medium	Short-term	$40,000

Table 3. Potential Safety Enhancement Summary

Safety Issue	Safety Enhancement	Responsibility	Safety Payoff	Time Frame	Cost
Blue Hill Avenue at Harvard Street and Talbot Avenue					
Pedestrian Accommodations	Replace pedestrian signal heads with heads with countdown intervals.	City	Low	Short-term	$20,000
Pedestrian Accommodations	Revise pedestrian and vehicle clearance times to meet current standards.	City	Medium	Short-term	Low
Pedestrian Accommodations	Consider concurrent pedestrian phasing. Concurrent operation needs to be carefully considered against turning volumes.	City	Medium	Short-term	Low
Pedestrian Accommodations, Islands	Reduce size of the cement concrete island on the west leg of Harvard Street.	City	Medium	Short-term	$20,000
Pedestrian Accommodations, Islands	Revise island on the north leg of Blue Hill Avenue so that it does not interrupt the crosswalk.	City	Medium	Short-term	$25,000
Islands	Restrict U-turns at the intersection with R3-4 No U-Turn signs.	City	Medium	Short-term	$1,000
Islands	Provide an R4-7 (Keep Right) sign on the nose of the island on the west leg of Harvard Street.	City	High	Short-term	$250
Islands	Reset the R4-7 (Keep Right) sign on the south nose of the Blue Hill Avenue median island between the two intersections.	City	Low	Short-term	$250
Islands	Reduce size of the island separating the east legs of Harvard Street and Talbot Avenue, if feasible, to facilitate turning movements. Island modifications must consider pedestrian path and refuge area.	City	Medium	Mid-term	$50,000
Lane Use	Review signage and pavement markings for the bike lane, bus stop and no parking area adjacent to the northbound Blue Hill Avenue approach.	City	Medium	Short-term	TBD (Low)
Lane Use	Continue enforcement against vehicles improperly using turning lanes and shoulders to jump queues.	City (Police)	Medium	Short-term	$0 (Reduced enforcement elsewhere)
Lane Use	Provide lane designation sign for Talbot Avenue.	City	Low	Short-term	$500
Signal Control	Provide signage restricting left turns exiting the unsignalized tire shop driveway on the west side of the intersection.	City	Low	Short-term	$250

Table 3. Potential Safety Enhancement Summary

Safety Issue	Safety Enhancement	Responsibility	Safety Payoff	Time Frame	Cost
Pavement Markings	Reapply pavement markings, including crosswalk markings.	City	Medium	Short-term	$25,000
Parking	Adjust parking limits to maintain 20 foot minimum clearance next to crosswalks.	City	Medium	Short-term	$5,000
Parking	Enforce parking limits.	City (Police)	Medium	Short-term	$0 (Reduced enforcement elsewhere)
Warren Street at Quincy Street and Townsend Street					
NB Lane Configuration	Improve signage and pavement markings for the bus stop on the Warren Street northbound approach.	City	Medium	Short-term	Low
NB Lane Configuration	Consider relocating bus stop to the far side of the intersection	City	Medium	Short-term	TBD (Medium)
SB Lane Trap	Improve signage and pavement markings for the Warren Street southbound left turn lane trap.	City	Medium	Short-term	$5,000
Queueing	Review traffic signal timings to reduce northbound queues.	City	Medium	Short-term	Low
U-Turns	Restrict U-turns for the median-divided north leg of the intersection with a R3-4 No U-Turn sign.	City	Medium	Short-term	$250
Signage	Determine whether an R10-11 No Turn on Red sign is appropriate for Townsend Street	City	Low	Short-term	$250

Appendix A. RSA Meeting Agenda

Agenda

Road Safety Audit

Boston, MA
High Crash Locations
Blue Hill Avenue and Warren Street

Meeting Location: Boston Police Station B-3
1165 Blue Hill Avenue, Dorchester, MA
Wednesday, September 14, 2016
9:00 AM – 3:00 PM

Type of meeting:	**High Crash Location – Road Safety Audit**
Attendees:	**Invited Participants to Comprise a Multidisciplinary Team**
Please bring:	**Thoughts and Enthusiasm!!**
9:00 AM	**Welcome and Introductions**
9:15 AM	**Discussion of Safety Issues** • Crash history, Speed Regulations – provided in advance • Existing Geometries and Conditions
10:30 AM	**Site Visit** • Walk to areas along Blue Hill Avenue • As a group, identify areas for improvement • Supplement site visit with Google Street View imagery
12:00 PM	**Discussion of Potential Improvements** • Discuss observations and finalize safety issue areas • Discuss potential improvements and finalize recommendations
3:00 PM	**Adjourn for the Day – but the RSA has not ended**

Instructions for Participants:

- **Before attending the RSA on September 14th, participants are encouraged to drive/walk through the intersections and complete/consider elements on the RSA Prompt List with a focus on safety.**
- **All participants will be actively involved in the process throughout. Participants are encouraged to come with thoughts and ideas, but are reminded that the synergy that develops and respect for others' opinions are key elements to the success of the overall RSA process.**
- **After the RSA meeting, participants will be asked to comment and respond to the document materials to assure it is reflective of the RSA completed by the multidisciplinary team.**

Appendix B. RSA Audit Team Contact List

Participating Audit Team Members

Date: September 14, 2016 Location: Boston – Blue Hill Ave/Warren St High Crash Locations

Audit Team Member	Agency/Affiliation	Email Address	Phone Number
Greg Lucas	BETA	GLucas@BETA-Inc.com	781-255-1982
Justin Curewitz	BETA	JCurewitz@BETA-Inc.com	781-255-1982
Bonnie Polin	MassDOT Safety	Bonnie.Polin@state.ma.us	857-368-9636
Chris Falcos	MassDOT	Christopher.Falcos@dot.state.ma.us	978-387-7860
Kush Bhagat	MassDOT Safety	Kush.Bhagat@dot.state.ma.us	857-368-9632
Elsa Chan	MassDOT Safety	Elsa.Chan@dot.state.ma.us	
Dorothea Hass	WalkBoston	DHass@walkboston.org	617-367-9255
Martin Harrison	BPD	Martin.harrison@pd.boston.gov	617-343-4708
Lt. Bill Lessard	Boston EMS	Lessard@bostonems.org	617-343-1144
Ruth Georges	ONS – Mayor's Office	Ruth.Georges@boston.gov	617-635-2677
Carl McKenzie	BTD	Carl.McKenzie@boston.gov	617-635-4758

Appendix C. Detailed Crash Data

BETA

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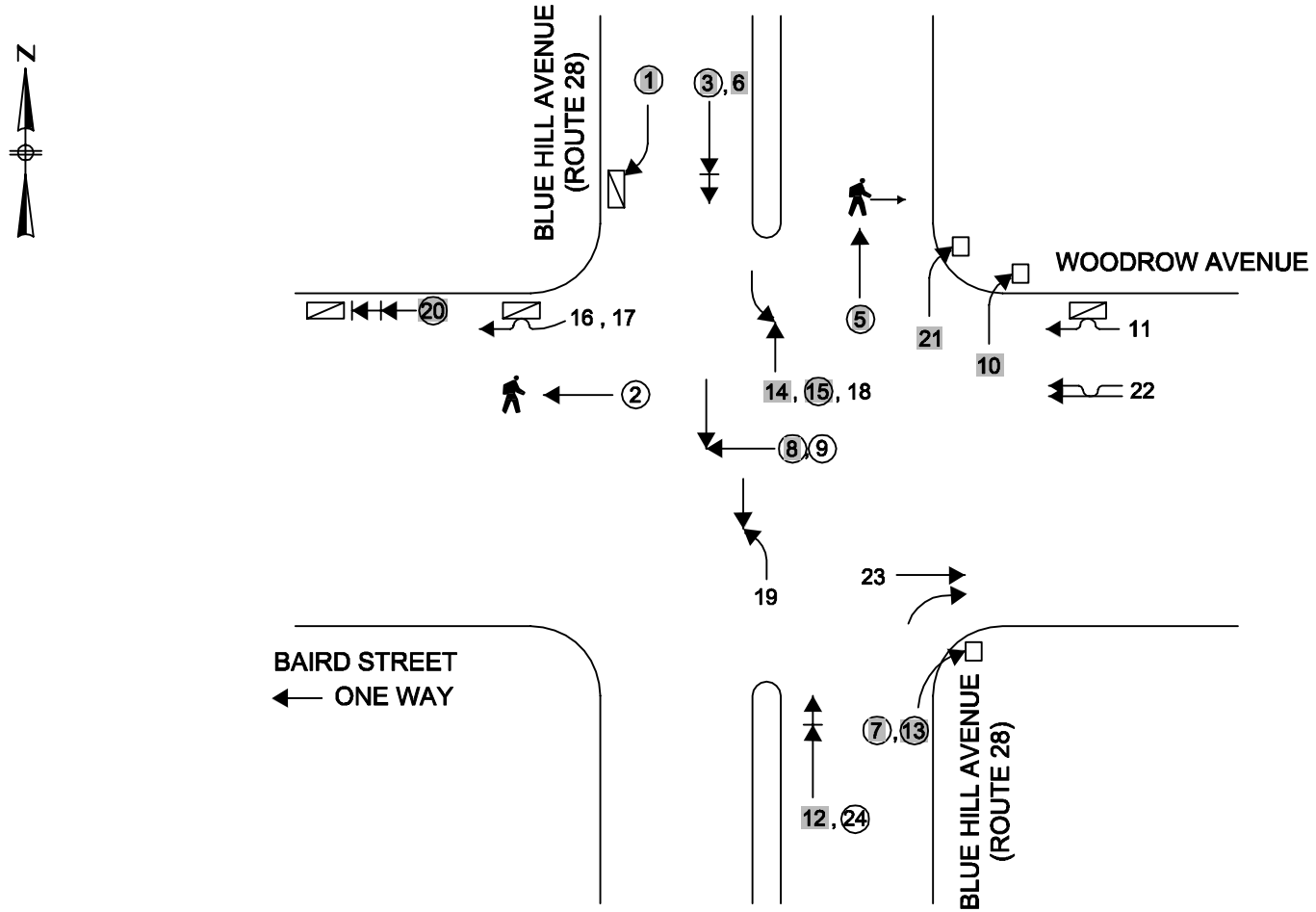
COLLISION DIAGRAM



Crash (4) could not be mapped

Intersection: Blue Hill Avenue (Route 28) at Baird Street/Woodrow Avenue

Date Range: January 2012 - December 2014

SYMBOLS	COLLISION TYPES
Moving Vehicle	Rear End
Backing Vehicle	Head On
Non-Involved Vehicle	Side Swipe
Pedestrian	Out of Control
Bicycle	Left Turn
Parked Vehicle	Right Angle
Fixed Object	# Nighttime Crash
Fatal Accident	
Injury Accident	

Crash Data Summary Table

Blue Hill Avenue (Route 28) at Baird Street/Woodrow Avenue, Boston, MA

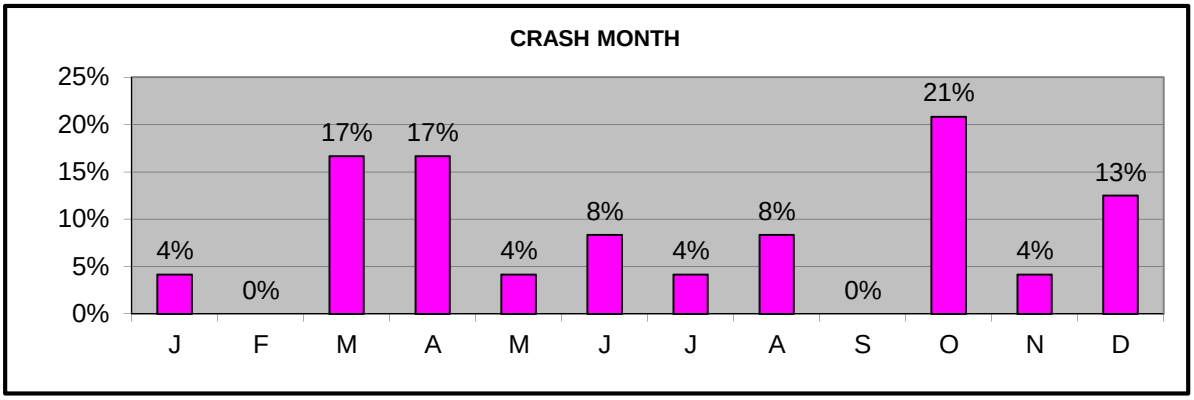
January 2012 - December 2014

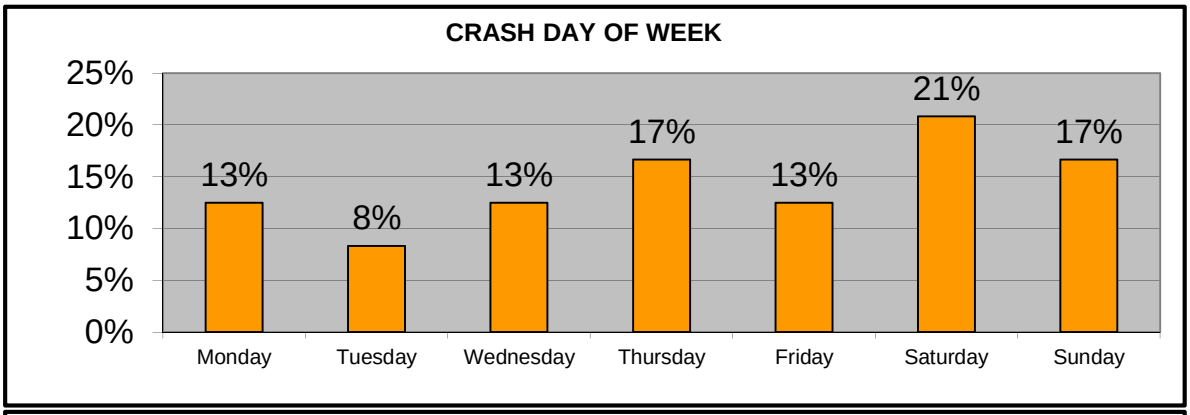
Crash Diagram Ref #	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	Ages			Comments
	m/d/y			*Type*	*Type*	*Type*	*Type*	*Type*	*D1*	*D2*	*D3*	
1	3/2/12	Friday	6:53 PM	Single Vehicle Crash	Dark - lighted roadway	Clear	Unknown	Fatigued/asleep	75	58		Driver Fell Asleep, hit parked car
2	3/21/12	Wednesday	5:46 PM	Single Vehicle Crash	Daylight	Clear	Unknown	Glare	51			Struck pedestrian in CW, Solar Glare
3	4/3/12	Tuesday	8:59 PM	Rear-end	Dark - lighted roadway	Clear	Unknown	No Improper Driving	23	37		Stopped for pedestrians crossing during green light
4	6/28/12	Thursday	10:00 PM	Single Vehicle Crash	Dark - lighted roadway	Clear	Unknown	Unknown				Hit and run with parked vehicle
5	10/6/12	Saturday	8:02 PM	Single Vehicle Crash	Dark - lighted roadway	Cloudy	Unknown	Visibility Obstructed	73	48		Stuck pedestrian appr. 40 North of CW, stated vehicle in left lane obstructed view
6	11/13/12	Tuesday	5:50 PM	Rear-end	Dark - lighted roadway	Other	Unknown	Followed too closely	41			Hit and run
7	12/9/12	Sunday	3:38 AM	Single Vehicle Crash	Dark - lighted roadway	Unknown	Unknown	Operating Vehicle in erratic, reckless, careless, negligent, or aggressive manner				Struck pedestrian signal, possible OUI
8	12/10/12	Monday	7:00 AM	Angle	Dark - lighted roadway	Rain	Wet	Disregarded traffic signs, signals, road markings	43	53		Ran Red Light
9	1/27/13	Sunday	8:42 AM	Angle	Daylight	Unknown	Unknown	Glare	49	54		Did not see the light change due to solar glare
10	3/13/13	Wednesday	1:37 AM	Single Vehicle Crash	Dark - lighted roadway	Unknown	Unknown	Driving too fast for conditions	28			Took the turn too fast and struck light pole
11	4/8/13	Monday	2:00 PM	Sideswipe, same direction	Daylight	Clear	Dry	No Improper Driving	43	58		Struck open door of parked vehicle
12	4/27/13	Saturday	3:00 AM	Rear-end	Dark - lighted roadway	Unknown	Unknown	Unknown	23			Hit and run
13	5/10/13	Friday	2:18 AM	Single Vehicle Crash	Dark - lighted roadway	Rain	Wet	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway, etc.	39			Swerved to avoid vehicle that cut them off, struck pedestrian signal
14	4/3/13	Wednesday	10:07 PM	Angle	Dark - lighted roadway	Unknown	Unknown	Unknown	25			Hit and Run
15	6/22/13	Saturday	10:53 PM	Angle	Dark - lighted roadway	Unknown	Unknown	Unknown				Motorcycle struck rear of turning vehicle
16	8/10/13	Saturday	3:00 PM	Sideswipe, same direction	Daylight	Unknown	Unknown	Driving too fast for conditions				Turning right from Blue Hill Ave and struck open door of parked vehicle
17	8/10/13	Saturday	2:45 PM	Sideswipe, same direction	Daylight	Unknown	Unknown	No Improper Driving	36			Turning right from Blue Hill Ave and struck open door of parked vehicle
18	10/13/13	Sunday	6:30 AM	Angle	Daylight	Clear	Unknown	Failed to yield right of way	25	49		
19	3/7/14	Friday	9:34 AM	Angle	Daylight	Clear	Unknown	Failed to yield right of way	54	20		
20	7/27/14	Sunday	2:08 AM	Rear-end	Dark - lighted roadway	Unknown	Unknown	Unknown	45	18	46	Rear-end involving parked vehicle; 3 vehicles involved
21	10/9/14	Thursday	10:00 PM	Single Vehicle Crash	Dark - lighted roadway	Unknown	Unknown	Unknown				Motorcycle struck signal post and driver fled scene
22	10/23/14	Thursday	2:55 PM	Sideswipe, same direction	Daylight	Rain	Wet	No Improper Driving	51	54		Tried to squeeze vehicle at red light
23	10/30/14	Thursday	6:15 AM	Angle	Daylight	Unknown	Unknown	Unknown	21			Hit and run
24	12/8/14	Monday	1:01 PM	Rear-end	Daylight	Snow	Snow	Unknown	74	24		

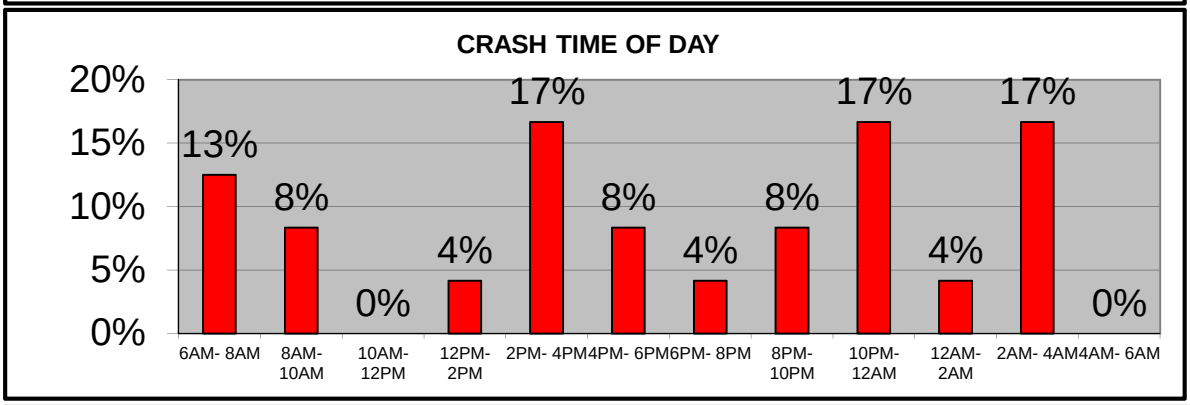
Summary based on Crash Reports obtained from the Boston Police Department

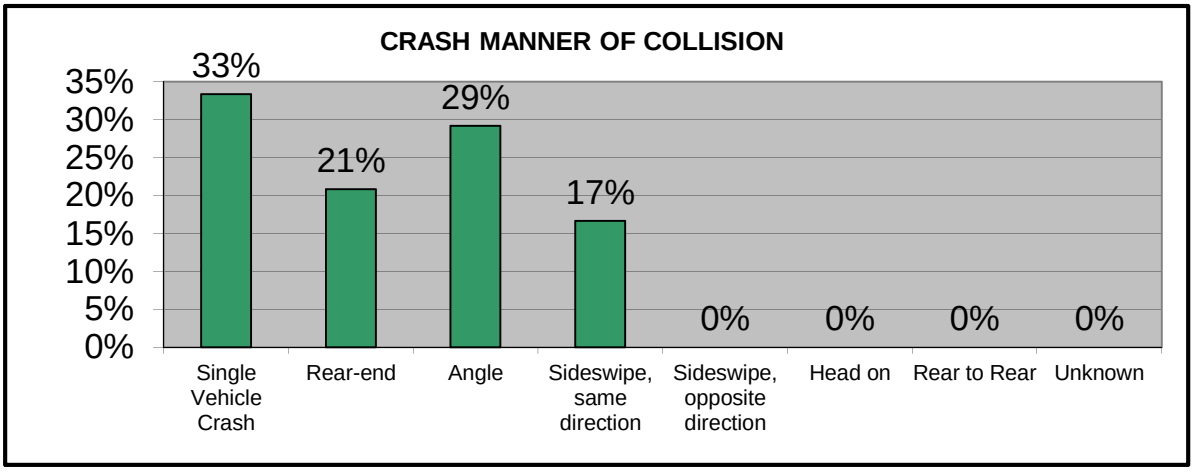
Crash Data Summary Tables and Charts

Blue Hill Avenue (Route 28) at Baird Street/Woodrow Avenue, Boston, MA



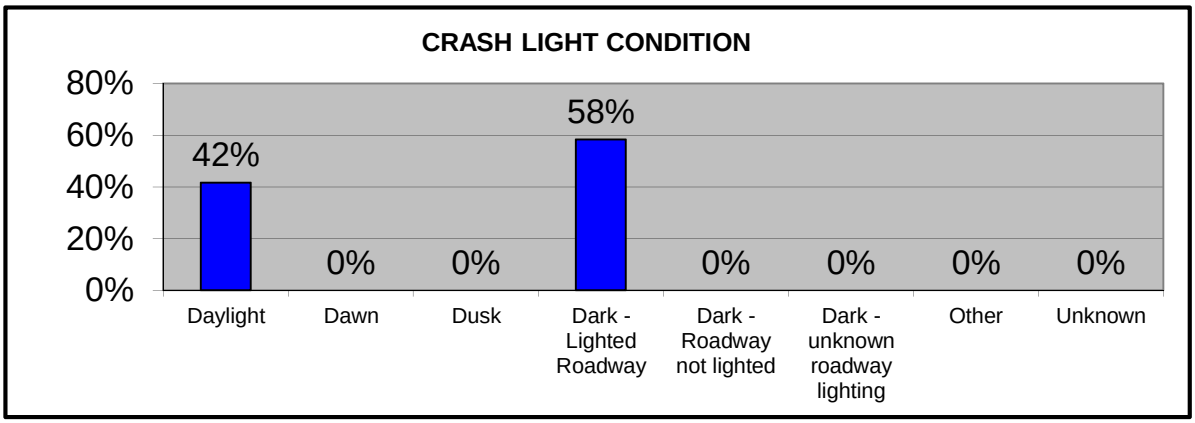


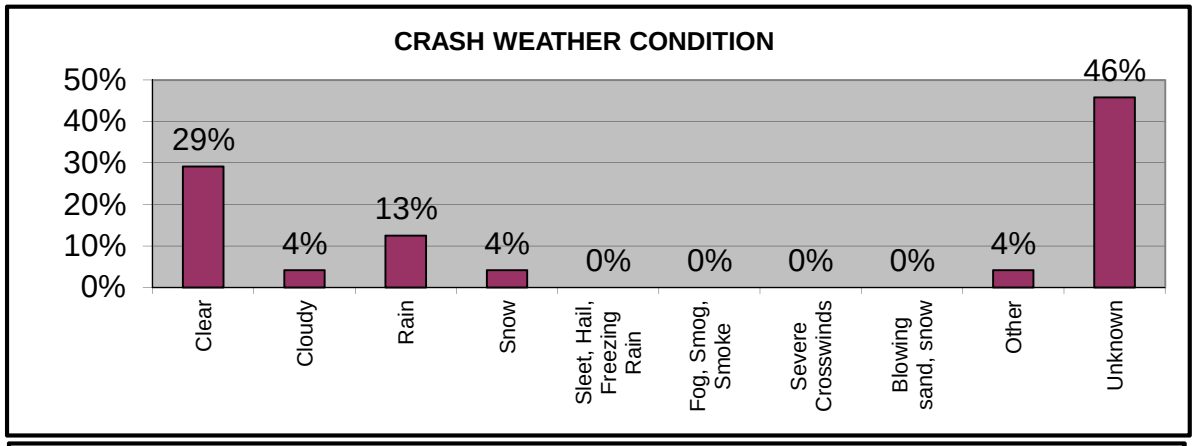


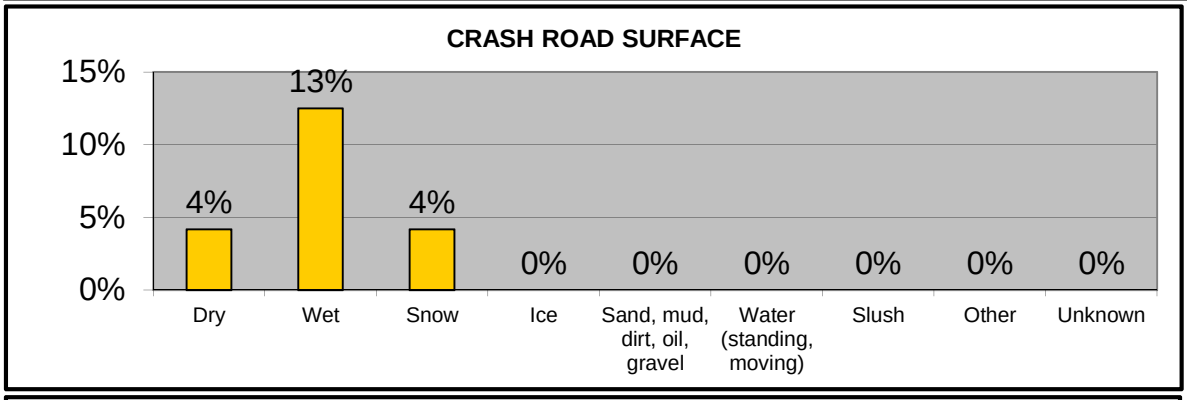


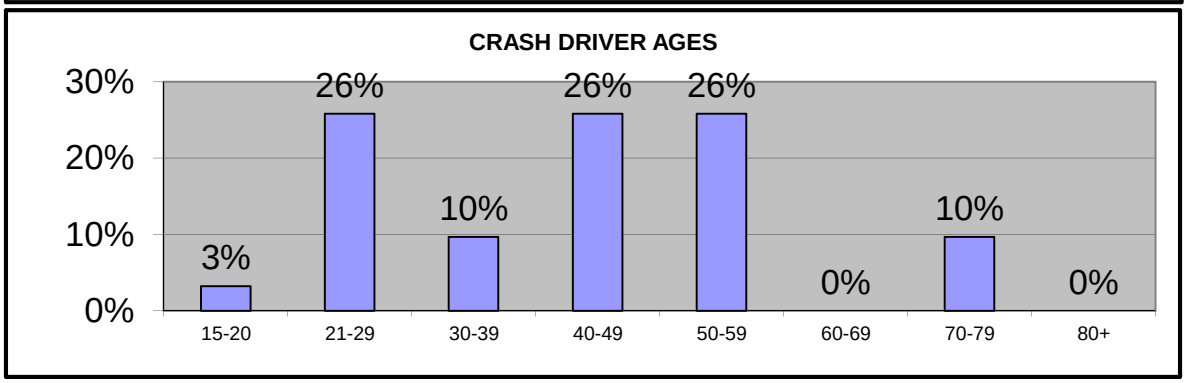
Crash Data Summary Tables and Charts

Blue Hill Avenue (Route 28) at Baird Street/Woodrow Avenue, Boston, MA









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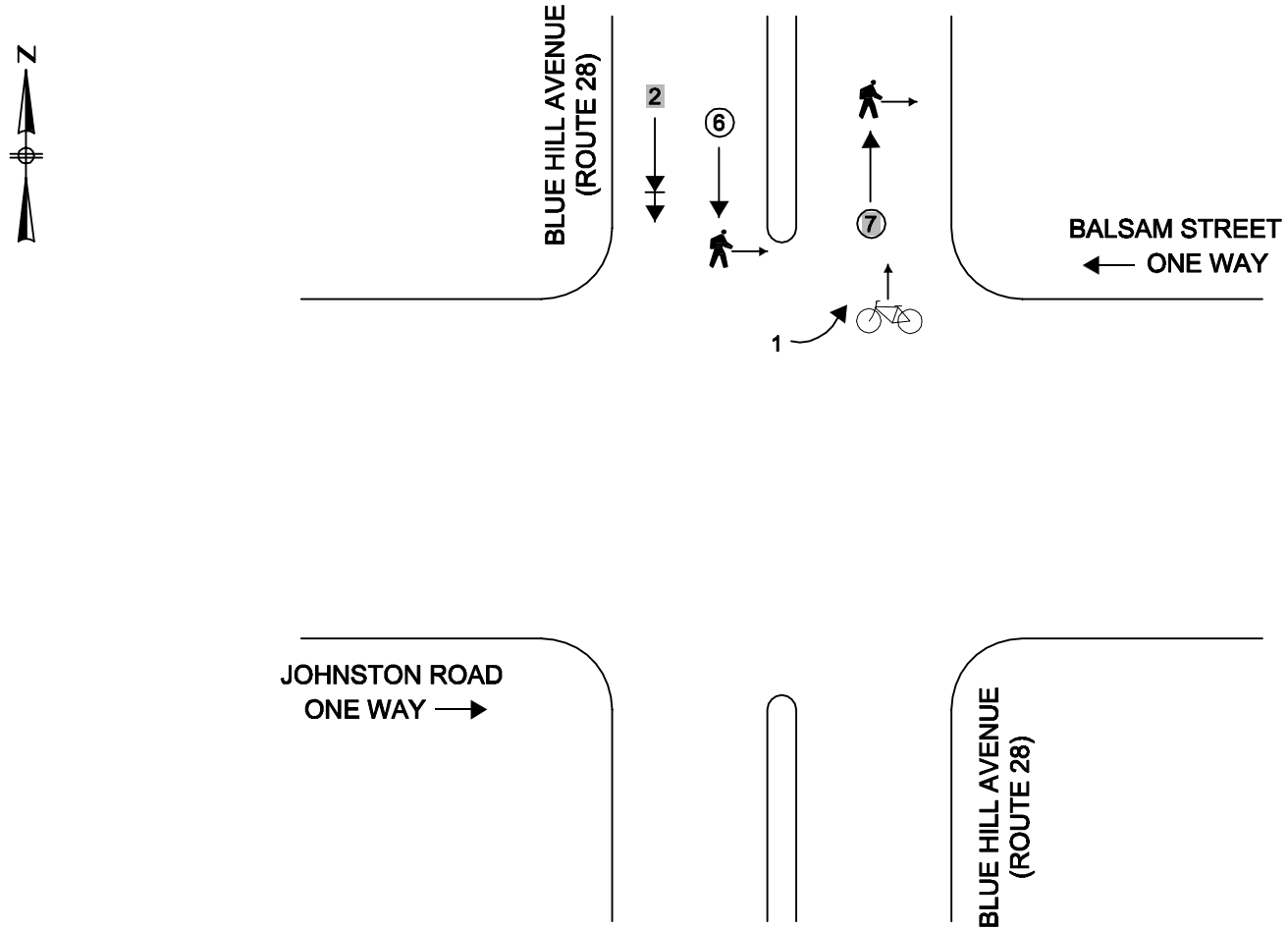
COLLISION DIAGRAM



Crashes 3, 4, 5 could not be mapped

Intersection: Blue Hill Avenue (Route 28) at Balsam Street/Johnston Road

Date Range: January 2012 - December 2014

SYMBOLS	COLLISION TYPES
Moving Vehicle	Rear End
Backing Vehicle	Head On
Non-Involved Vehicle	Side Swipe
Pedestrian	Out of Control
Bicycle	Left Turn
Parked Vehicle	Right Angle
Fixed Object	# Nighttime Crash
Fatal Accident	
Injury Accident	

Crash Data Summary Table

Blue Hill Avenue (Route 28) at Balsam Street/Johnston Road, Boston, MA

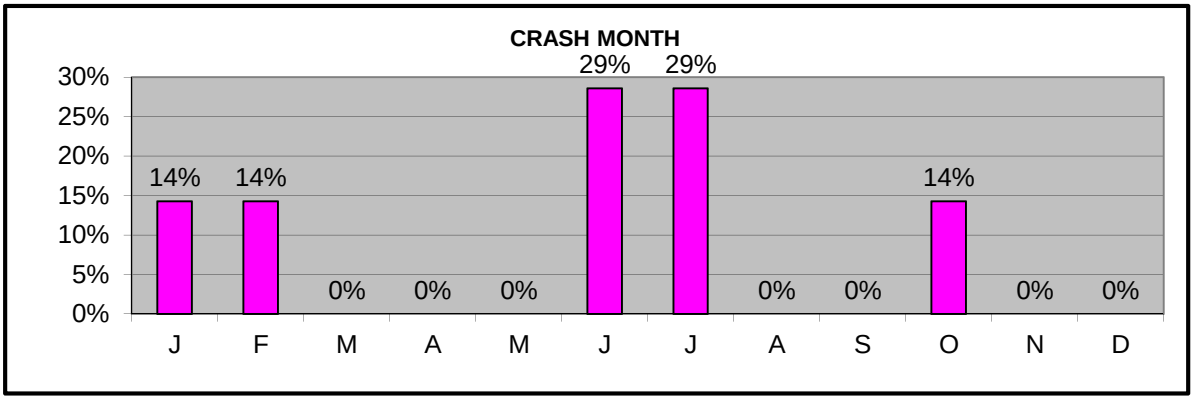
January 2012 - December 2014

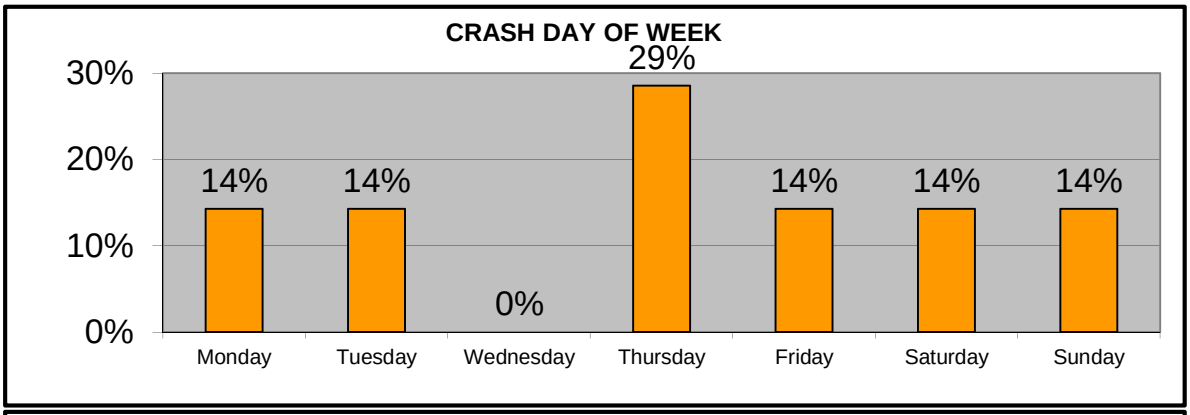
Crash Diagram Ref #	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	Ages	Comments
	m/d/y			*Type*	*Type*	*Type*	*Type*	*Type*	*D1*	
1	2/24/13	Sunday	4:18 PM	Angle	Daylight	Rain	Wet	Made an improper turn	54	Vehicle made an illegal u-turn and struck bicycle
2	6/3/13	Monday	2:30 AM	Rear-end	Dark - lighted roadway	Clear	Dry	No Improper Driving	29	Hit and run
3	6/4/13	Tuesday	9:05 PM	Single Vehicle Crash	Dark - lighted roadway	Clear	Dry	No Improper Driving	28	Hit and run with a parked vehicle
4	7/6/13	Saturday	6:50 PM	Unknown	Daylight	Unknown	Unknown	Unknown	23	Hit and run traveling NB
5	10/25/13	Friday	11:00 PM	Sideswipe, same direction	Dark - lighted roadway	Unknown	Unknown	Unknown		Driver had panic attack and sideswiped V2
6	1/30/14	Thursday	2:00 PM	Single Vehicle Crash	Daylight	Clear	Dry	No Improper Driving	14	Pedestrian ran across Blue Hill Ave during green light after getting off bus on Johnston St
7	7/3/14	Thursday	11:35 PM	Single Vehicle Crash	Dark - lighted roadway	Unknown	Unknown	Operating Vehicle in erratic, reckless, careless, negligent, or aggressive manner		Two pedestrians struck in CW. Driver fled scene; later discover was not using headlights

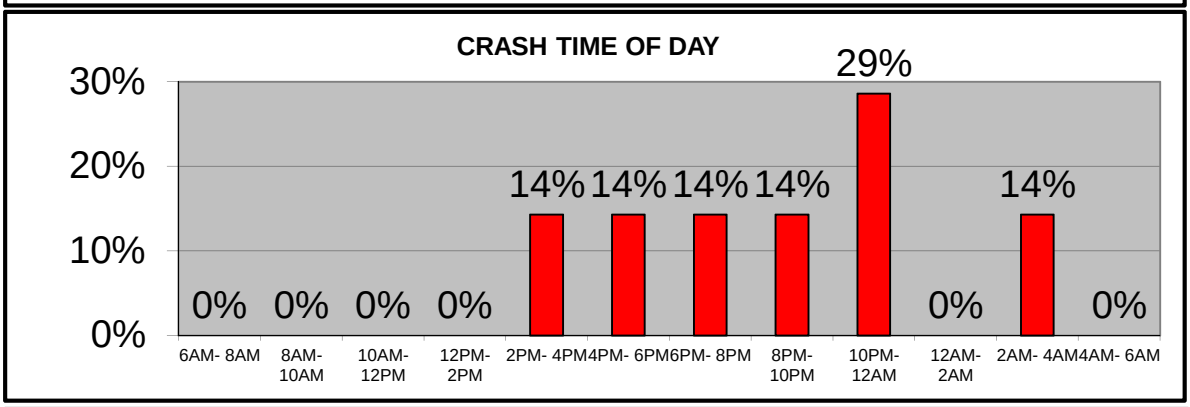
Summary based on Crash Reports obtained from the Boston Police Department

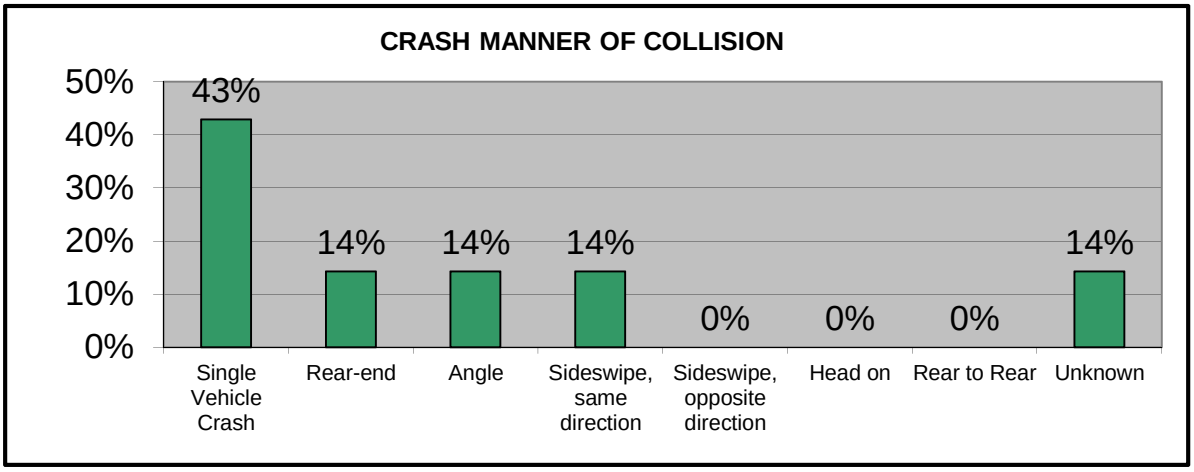
Crash Data Summary Tables and Charts

Blue Hill Avenue (Route 28) at Balsam Street/Johnston Road, Boston, MA



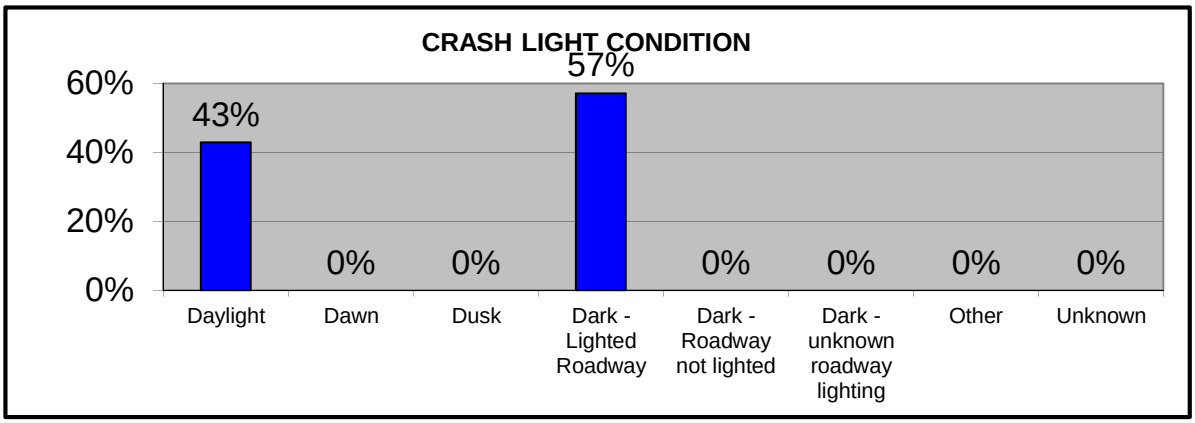


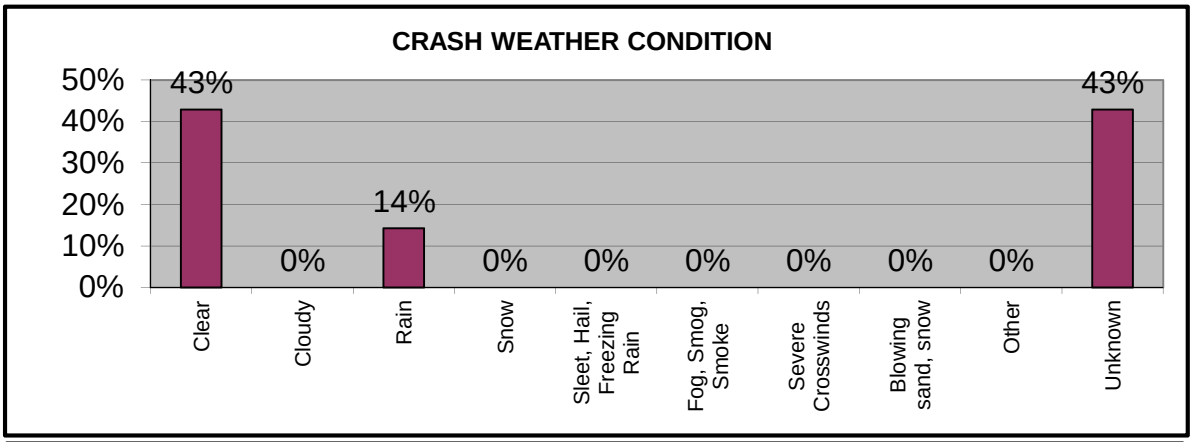


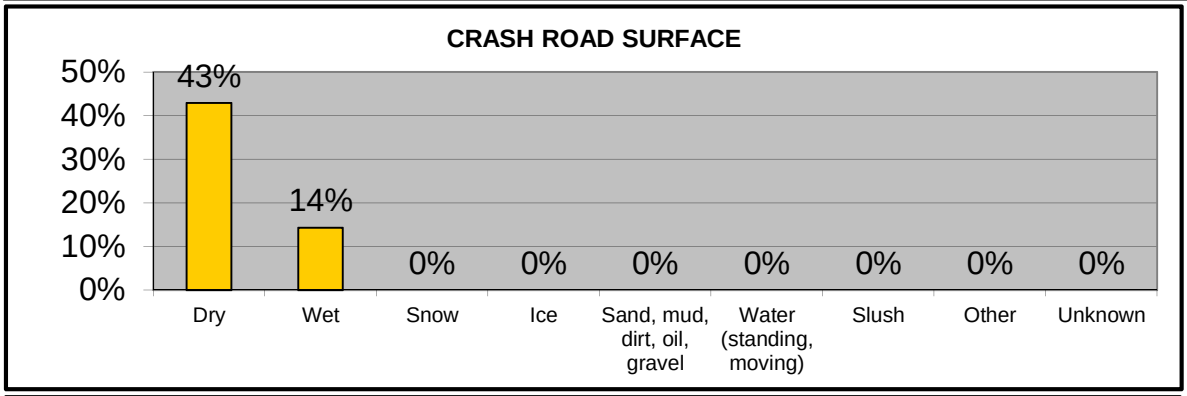


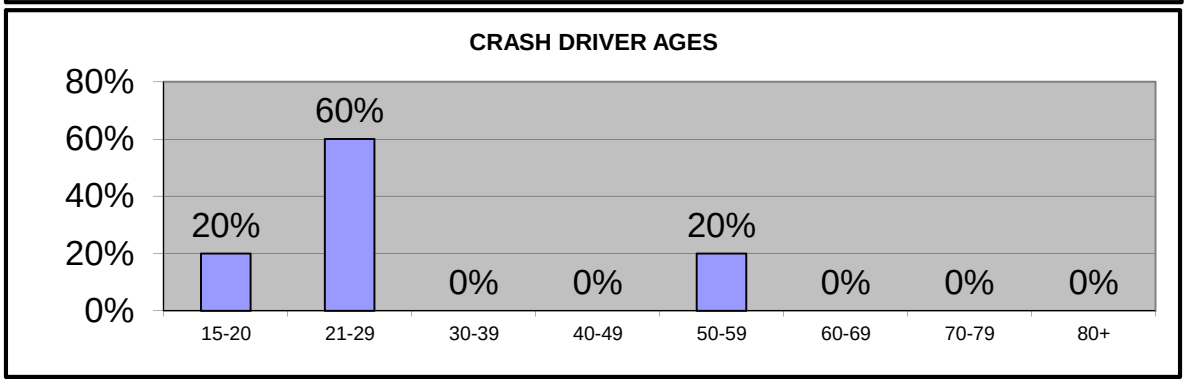
Crash Data Summary Tables and Charts

Blue Hill Avenue (Route 28) at Balsam Street/Johnston Road, Boston, MA









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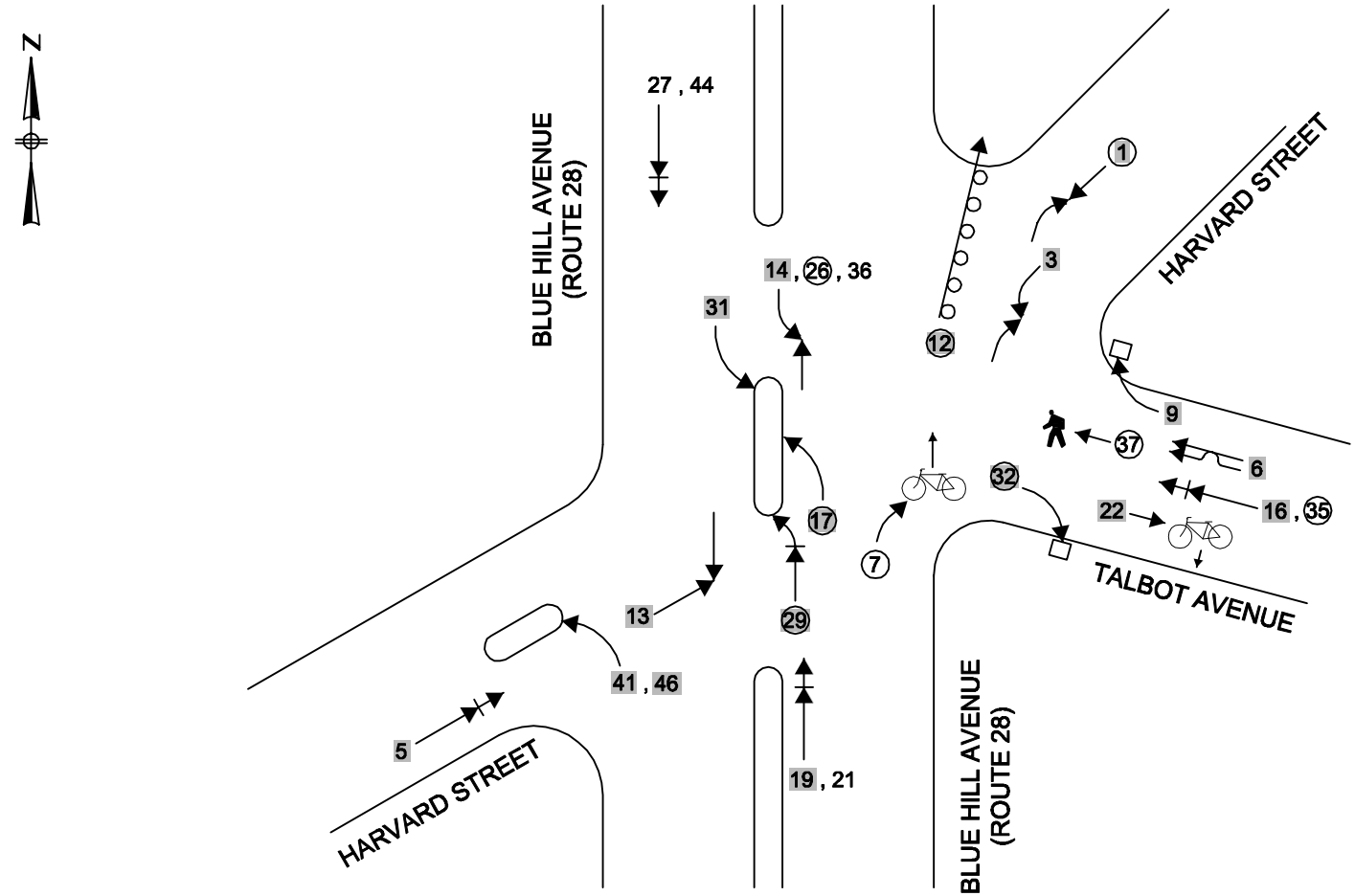
COLLISION DIAGRAM



Crashes 2 , 4 , 8 , 10 , 11 , 15 , 18 , 20 , 23 , 24 , 25 , 28 , 30 , 33 , 34 , 38 , 39 , 40 , 42 , 43 , 45 could not be mapped

Intersection: Blue Hill Avenue (Route 28) at Harvard Street/Talbot Avenue

Date Range: January 2012 - December 2014

SYMBOLS	COLLISION TYPES
Moving Vehicle	Rear End
Backing Vehicle	Head On
Non-Involved Vehicle	Side Swipe
Pedestrian	Out of Control
Bicycle	Left Turn
Parked Vehicle	Right Angle
Fixed Object	# Nighttime Crash
Fatal Accident	
Injury Accident	

Crash Data Summary Table

Blue Hill Avenue (Route 28) at Harvard Street/Talbot Avenue, Boston, MA

January 2012 - December 2014

Crash Diagram Ref #	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	Ages			Comments
	m/d/y			*Type*	*Type*	*Type*	*Type*	*Type*	*D1*	*D2*	*D3*	
1	1/14/12	Saturday	4:47 AM	Angle	Dark - lighted roadway	Clear	Unknown	Driving too fast for conditions	22			Speeding while turning onto Harvard Street and struck vehicle waiting at light on Harvard Street; also struck utility pole after striking vehicle
2	2/27/12	Monday	5:20 PM	Sideswipe, same direction	Daylight	Clear	Unknown	Failure to keep in proper lane or running off road	26	62		Crossed into other lane to go around vehicle
3	3/7/12	Wednesday	9:50 PM	Angle	Dark - lighted roadway	Clear	Unknown	Failed to yield right of way	42			Attempted to take left turn from Harvard Street to Talbot Avenue during red light; Hit and run
4	3/18/12	Sunday	9:37 PM	Rear-end	Dark - lighted roadway	Clear	Unknown	Driving too fast for conditions	34	22		Stopped for a red light on Blue Hill Avenue and was rear-ended
5	4/19/12	Thursday	8:13 PM	Rear-end	Dark - lighted roadway	Unknown	Unknown	Driving too fast for conditions				Hit and Run
6	5/17/12	Thursday	10:48 PM	Sideswipe, same direction	Dark - lighted roadway	Unknown	Unknown	Failure to keep in proper lane or running off road				Hit and Run
7	8/5/12	Sunday	10:20 AM	Single Vehicle Crash	Daylight	Clear	Unknown	Failure to keep in proper lane or running off road	45			Turning right onto Harvard Street and struck bicyclist
8	8/17/12	Friday	2:48 PM	Rear-end	Daylight	Clear	Unknown	Driving too fast for conditions	18			Unlicensed/unregistered driver
9	10/12/12	Friday	2:27 AM	Single Vehicle Crash	Dark - lighted roadway	Unknown	Unknown	Unknown				Jumped the curb turning right from Talbot Avenue to Harvard Street
10	10/19/12	Friday	4:30 PM	Rear-end	Daylight	Rain	Wet	Unknown	45			Hit and Run
11	10/28/12	Sunday	3:05 PM	Rear-end	Daylight	Rain	Wet	Unknown	55	21		Three vehicles involved
12	11/18/12	Sunday	4:45 PM	Single Vehicle Crash	Dark - lighted roadway	Clear	Unknown	Unknown	55			Lost control of vehicle and jumped curb on nose of island at Talbot Avenue and the struck Sun Pizza building face
13	11/28/12	Wednesday	2:31 AM	Angle	Dark - lighted roadway	Cloudy	Unknown	Unknown				Struck police car with emergency lights flashing
14	12/23/12	Sunday	1:38 AM	Angle	Dark - lighted roadway	Clear	Unknown	Failed to yield right of way	23			Both stated to have green light
15	1/12/13	Saturday	1:17 AM	Rear-end	Dark - lighted roadway	Rain	Wet	Driving too fast for conditions	59			Hit and Run
16	1/12/13	Saturday	3:10 AM	Rear-end	Dark - lighted roadway	Rain	Wet	Unknown	34	62		Unlicensed driver
17	1/13/13	Sunday	2:07 AM	Single Vehicle Crash	Dark - lighted roadway	Unknown	Unknown	Failure to keep in proper lane or running off road	63			Struck light pole in median island, knocking pole over. Possible DUI
18	4/23/13	Tuesday	9:01 PM	Rear-end	Dark - lighted roadway	Rain	Wet	Unknown	71	31		
19	5/23/13	Thursday	1:00 AM	Rear-end	Dark - lighted roadway	Clear	Unknown	Driving too fast for conditions				
20	6/3/13	Monday	5:38 AM	Rear-end	Daylight	Clear	Unknown	Unknown	30	39	45	Three vehicles involved
21	8/15/13	Thursday	5:35 AM	Rear-end	Daylight	Clear	Unknown	Failure to keep in proper lane or running off road	64	42		Attempted to change lanes and rear-ended vehicle
22	8/17/13	Saturday	11:20 PM	Single Vehicle Crash	Dark - lighted roadway	Clear	Unknown	Failed to yield right of way	27	45		Bicycle crossed Talbot Avenue between queued cars during red light; Vehicle had green light and struck bicyclist
23	8/20/13	Tuesday	9:30 PM	Rear-end	Dark - lighted roadway	Unknown	Unknown	Driving too fast for conditions	39			Hit and Run
24	9/4/13	Wednesday	12:55 PM	Angle	Daylight	Unknown	Unknown	Failed to yield right of way	57			Turning right from Blue Hill Avenue southbound to Harvard Street; Hit and Run
25	10/4/13	Friday	2:22 PM	Rear-end	Daylight	Unknown	Unknown	Driving too fast for conditions	46			Attempting to take a left-turn; Hit and Run
26	11/3/13	Sunday	12:40 PM	Angle	Daylight	Cloudy	Unknown	Failed to yield right of way	54	50		
27	11/9/13	Saturday	12:45 PM	Rear-end	Daylight	Unknown	Unknown	Unknown				Hit and Run
28	1/23/14	Thursday	1:04 PM	Rear-end	Daylight	Clear	Unknown	Unknown	31	24		Turning from Talbot Avenue to Blue Hill Avenue/Unlicensed operator
29	3/8/14	Saturday	8:15 PM	Rear-end	Dark - lighted roadway	Clear	Unknown	Unknown	21	40		Four vehicles involved; two vehicles caused crash fled the scene; result of the crash pushed one vehicle into another, forcing lead vehicle up onto island on Blue Hill Avenue
30	3/21/14	Friday	6:05 PM	Sideswipe, same direction	Dark - lighted roadway	Unknown	Unknown	Unknown	34			Hit and Run
31	3/22/14	Saturday	5:30 AM	Single Vehicle Crash	Dark - lighted roadway	Unknown	Unknown	Unknown				Vehicle was unattended on median island on Blue Hill Avenue
32	4/7/14	Monday	4:00 AM	Single Vehicle Crash	Dark - lighted roadway	Unknown	Unknown	Unknown	41			Vehicle struck stone wall on Talbot Avenue head-on; OUI

Crash Data Summary Table

Blue Hill Avenue (Route 28) at Harvard Street/Talbot Avenue, Boston, MA

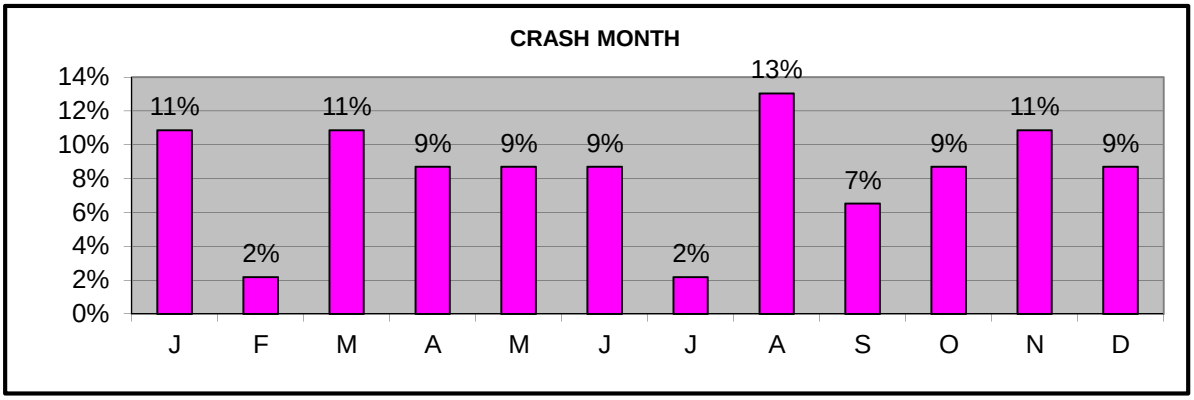
January 2012 - December 2014

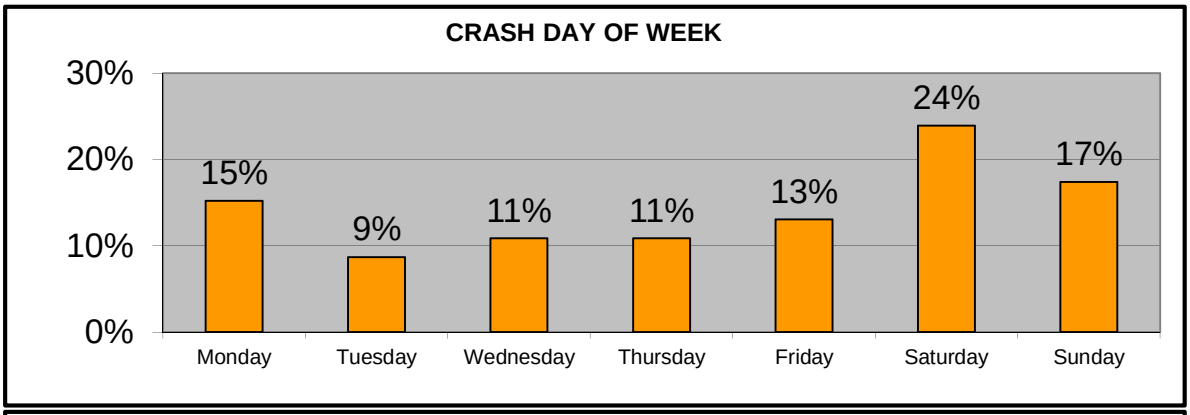
Crash Diagram Ref #	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	Ages			Comments
	m/d/y			*Type*	*Type*	*Type*	*Type*	*Type*	*D1*	*D2*	*D3*	
33	4/14/14	Monday	1:00 PM	Single Vehicle Crash	Daylight	Clear	Unknown	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway, etc.	83			Was cut-off and swerved out of the way to avoid crash, struck pole
34	5/17/14	Saturday	4:15 PM	Rear-end	Daylight	Unknown	Unknown	Unknown	56			Hit and Run
35	5/20/14	Tuesday	4:00 PM	Rear-end	Daylight	Clear	Unknown	Followed too closely	31	27		Stopped suddenly for vehicle in front and was rear-ended
36	6/14/14	Saturday	5:05 PM	Angle	Daylight	Clear	Unknown	No Improper Driving	36	32		Attempted to get out of way for police car with emergency lights on and drove into path of northbound vehicle
37	6/18/14	Wednesday	3:25 PM	Single Vehicle Crash	Daylight	Clear	Unknown	No Improper Driving				Vehicle stopped at red light on Talbot Avenue, when light turned green and proceeded to go driver struck pedestrian
38	6/27/14	Friday	9:25 AM	Rear-end	Daylight	Clear	Unknown	Unknown				Stopped at red light
39	7/16/14	Wednesday	3:45 PM	Unknown	Daylight	Rain	Wet	Unknown	69	50		Unknown
40	8/23/14	Saturday	6:30 AM	Rear-end	Daylight	Clear	Unknown	Unknown	19	35		Backed vehicle into other vehicle; Hit and Run
41	9/2/14	Tuesday	5:47 AM	Single Vehicle Crash	Dark - lighted roadway	Clear	Unknown	Failure to keep in proper lane or running off road	25			Claimed to not see median when turning left onto Harvard Street
42	9/6/14	Saturday	12:00 PM	Sideswipe, same direction	Daylight	Unknown	Unknown	Failure to keep in proper lane or running off road				Tried to squeeze by queued vehicle in order to make green light
43	11/17/14	Monday	3:05 PM	Rear-end	Daylight	Rain	Wet	Unknown	18	63		Student driver was rear-ended
44	12/14/14	Sunday	11:30 AM	Rear-end	Daylight	Unknown	Unknown	Unknown				
45	12/15/14	Monday	5:58 PM	Single Vehicle Crash	Dark - lighted roadway	Unknown	Unknown	Unknown				Struck pedestrian who ran across street as light turned green\
46	12/15/14	Monday	9:39 PM	Single Vehicle Crash	Dark - lighted roadway	Clear	Unknown	Failure to keep in proper lane or running off road	31			Claimed to not see median when turning left onto Harvard Street

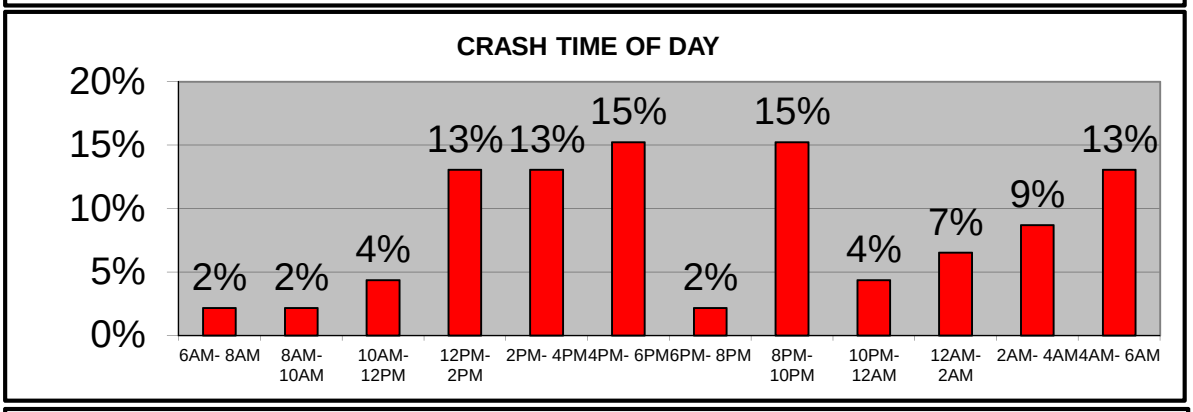
Summary based on Crash Reports obtained from the Boston Police Department

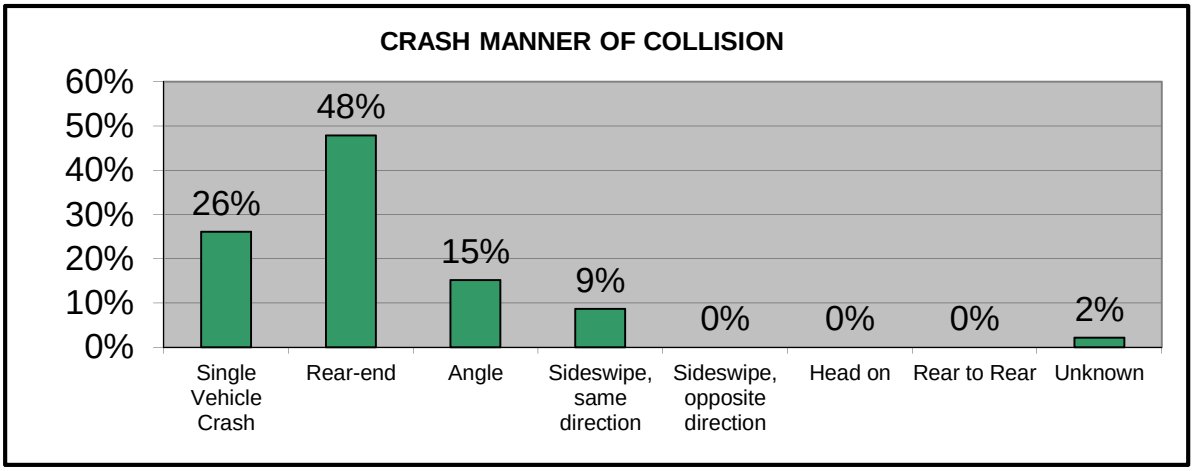
Crash Data Summary Tables and Charts

Blue Hill Avenue (Route 28) at Harvard Street/Talbot Avenue, Boston, MA



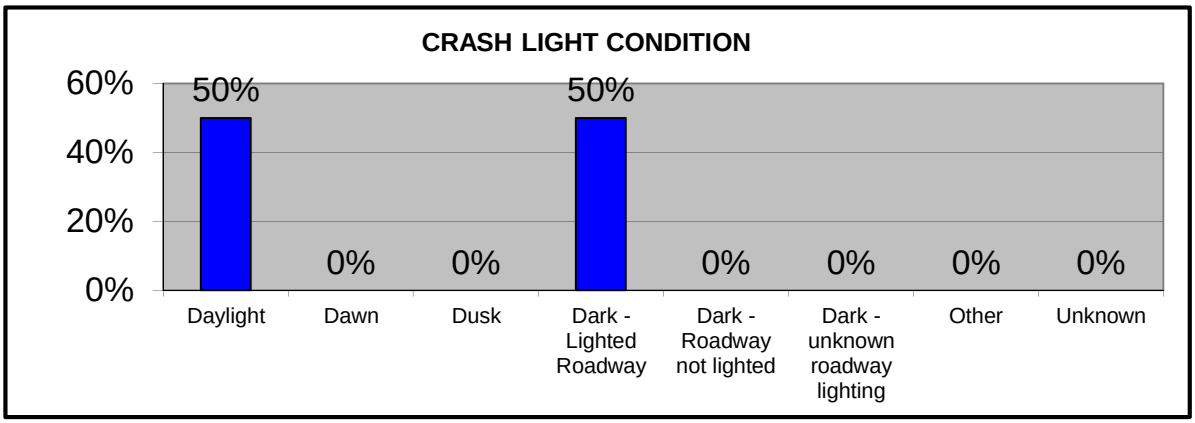


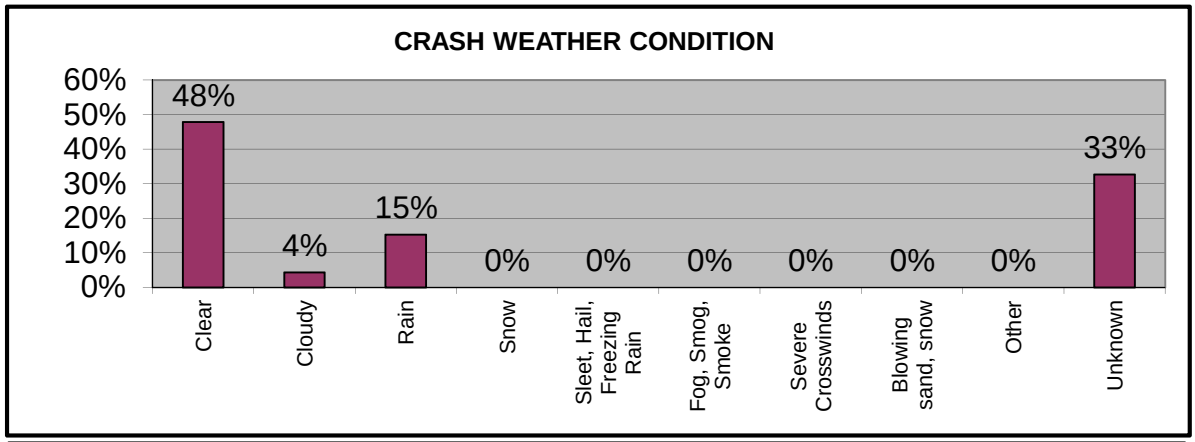


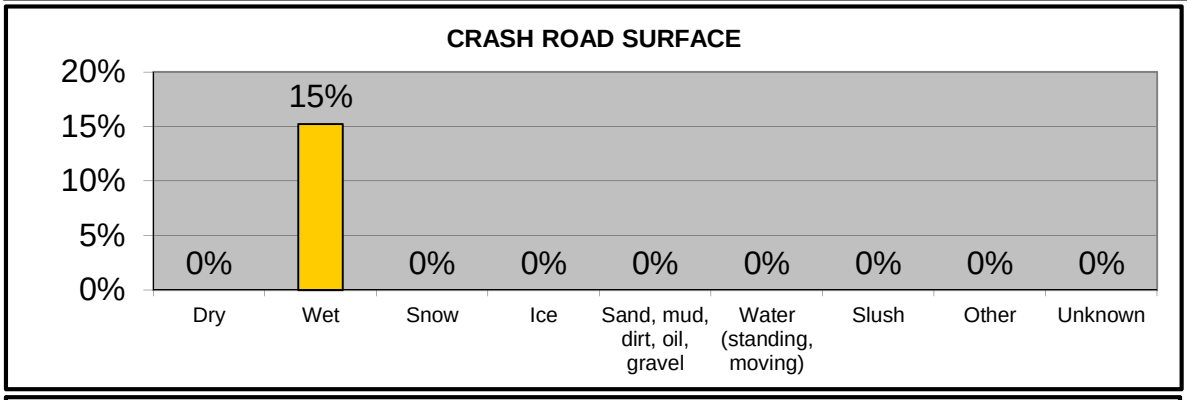


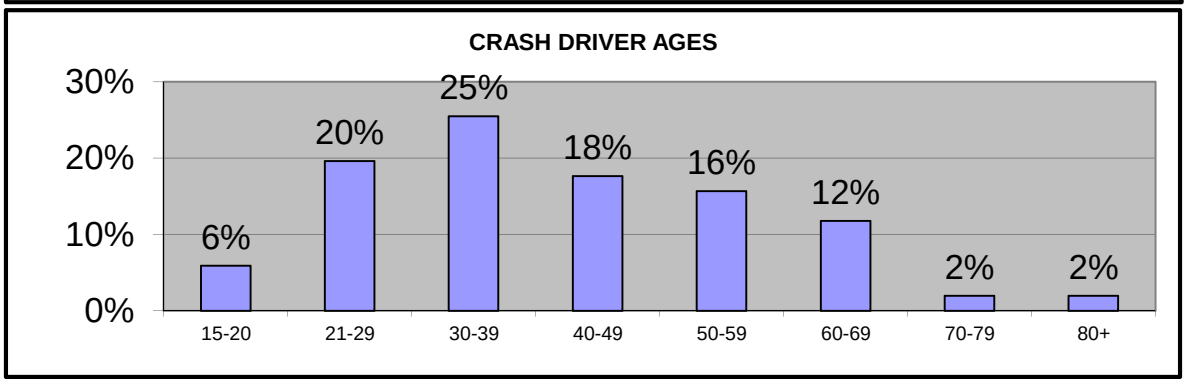
Crash Data Summary Tables and Charts

Blue Hill Avenue (Route 28) at Harvard Street/Talbot Avenue, Boston, MA









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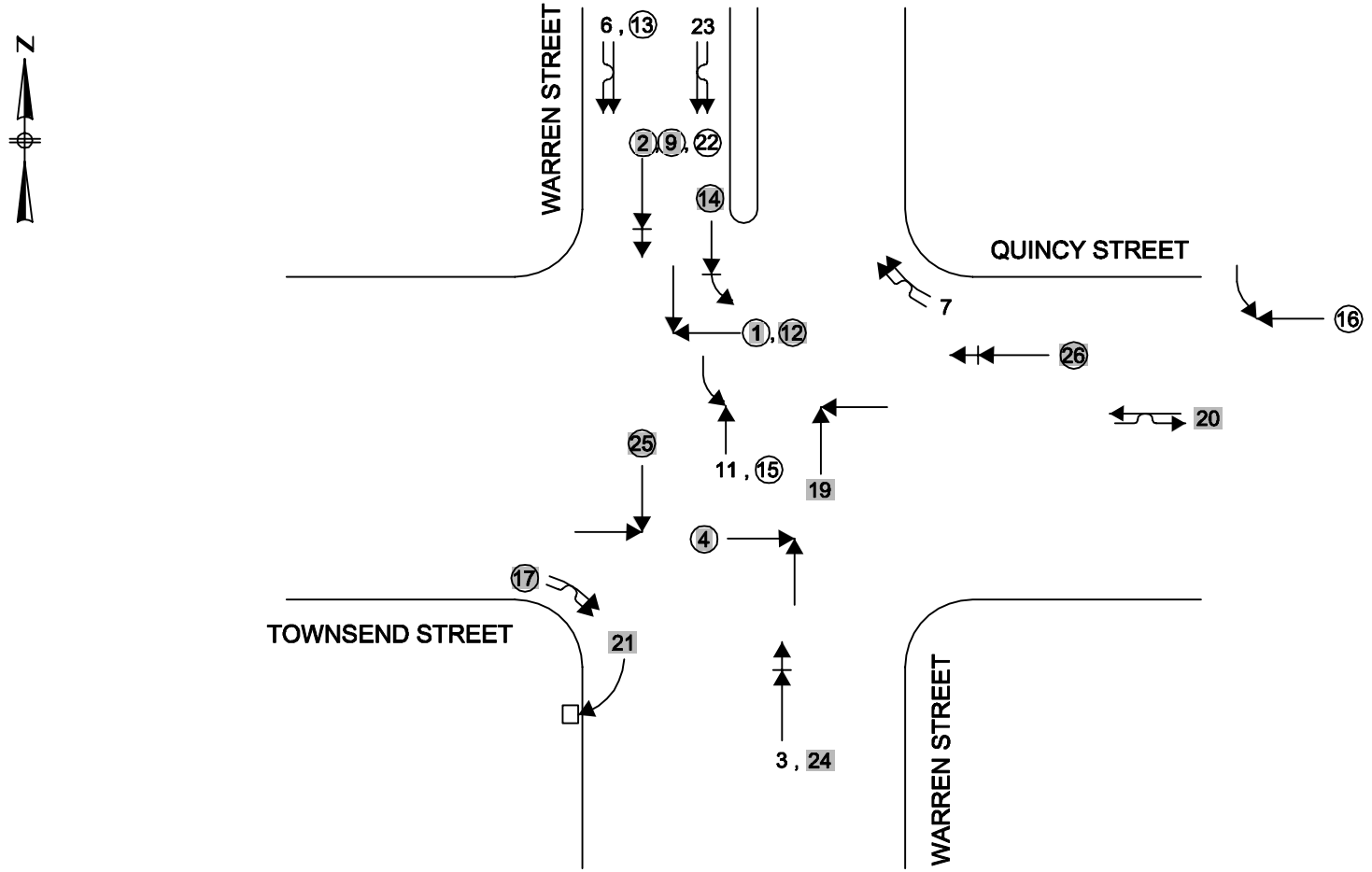
COLLISION DIAGRAM



Crashes 5 , 8 , 10 , 18 could not be mapped

Intersection: Warren Street at Quincy Street/Townsend Street

Date Range: January 2012 - December 2014

SYMBOLS	COLLISION TYPES
Moving Vehicle	Rear End
Backing Vehicle	Head On
Non-Involved Vehicle	Side Swipe
Pedestrian	Out of Control
Bicycle	Left Turn
Parked Vehicle	Right Angle
Fixed Object	
Fatal Accident	
Injury Accident	# Nighttime Crash

Crash Data Summary Table

Warren Street at Quincy Street/Townsend Street, Boston, MA

January 2012 - December 2014

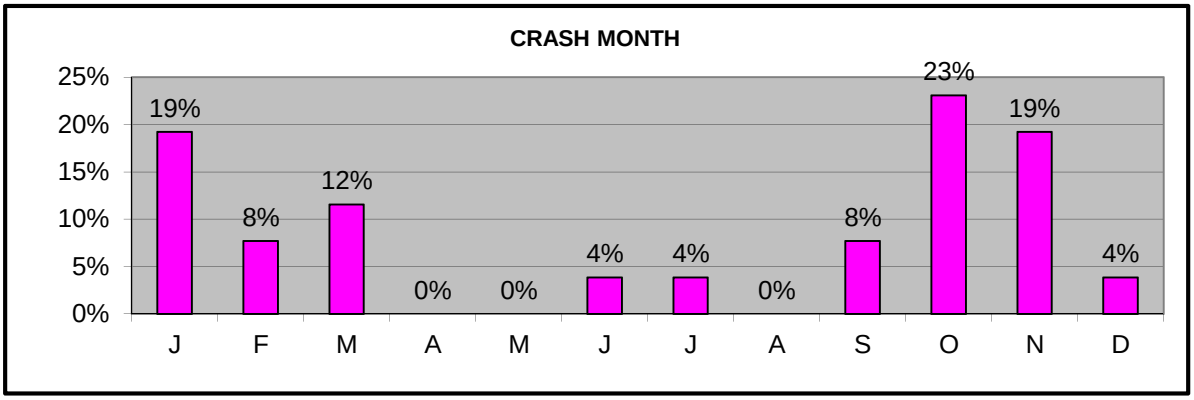
Crash Diagram Ref #	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	Ages			Comments
	m/d/y			*Type*	*Type*	*Type*	*Type*	*Type*	*D1*	*D2*	*D3*	
1	1/15/12	Sunday	3:22 AM	Angle	Dark - lighted roadway	Clear	Dry	Driving too fast for conditions	31	22		SB vehicle was speeding; signals were on flash operation
2	2/24/12	Friday	4:34 PM	Rear-end	Dark - lighted roadway	Rain	Wet	Operating defective equiptment				Police cruiser could not stop due to wet roadway
3	2/29/12	Wednesday	4:12 PM	Rear-end	Daylight	Snow	Snow	Driving too fast for conditions	23			Hit and run
4	3/4/12	Sunday	3:49 AM	Angle	Dark - lighted roadway	Clear	Unknown	Unknown	54			
5	3/13/12	Tuesday	12:22 PM	Rear-end	Daylight	Unknown	Unknown	Unknown				Hit and run
6	6/5/12	Tuesday	5:00 PM	Sideswipe, same direction	Daylight	Clear	Dry	Failure to keep in proper lane or running off road	22	30		Cut off vehicle
7	7/20/12	Friday	8:20 AM	Sideswipe, same direction	Daylight	Clear	Dry	Failure to keep in proper lane or running off road	52			Attempted to take a right from the left lane
8	9/24/12	Monday	11:35 AM	Rear-end	Daylight	Unknown	Unknown	No Improper Driving	29			Rolled back into MBTA van while stopped at red light
9	10/1/12	Monday	7:16 PM	Rear-end	Dark - lighted roadway	Clear	Unknown	Unknown	24	38		
10	10/2/12	Tuesday	5:58 AM	Unknown	Dark - lighted roadway	Clear	Unknown	Unknown	47	43	54	
11	10/27/12	Saturday	2:16 PM	Angle	Daylight	Clear	Unknown	No Improper Driving	28	31		Claimed did not see any vehicles coming NB
12	1/4/13	Friday	2:48 AM	Angle	Dark - lighted roadway	Clear	Unknown	Disregarded traffic signs, signals, road markings	34	43		Did not come to a complete stop at flashing red light
13	1/31/13	Thursday	11:48 AM	Rear-end	Daylight	Clear	Unknown	No Improper Driving	32	33		Foot slipped off of brake
14	10/18/13	Friday	10:18 PM	Rear-end	Dark - lighted roadway	Clear	Unknown	No Improper Driving	26	21		
15	10/19/13	Saturday	2:12 PM	Angle	Daylight	Clear	Unknown	Disregarded traffic signs, signals, road markings				Claims had the green LT arrow
16	11/6/13	Wednesday	12:25 PM	Single Vehicle Crash	Daylight	Clear	Unknown	Unknown	26	56		Courtesy Crash*
17	11/13/13	Wednesday	5:35 PM	Sideswipe, same direction	Dark - lighted roadway	Clear	Unknown	Unknown	47	42		Struck scooter while making a right-turn, scooter was unlicensed driver
18	11/15/13	Friday	3:15 PM	Rear-end	Daylight	Clear	Unknown	Unknown	34			Hit and run at red light
19	11/22/13	Friday	3:35 AM	Angle	Dark - lighted roadway	Clear	Unknown	Driving too fast for conditions	28	54		Speeding NB vehicle struck WB vehicle; signals on flash operation
20	1/18/14	Saturday	11:45 PM	Sideswipe, opposite direction	Dark - lighted roadway	Snow	Unknown	Unknown				Driver crossed into opoosite travel lane; hit and run
21	1/23/14	Thursday	1:35 AM	Single Vehicle Crash	Dark - lighted roadway	Clear	Unknown	Failure to keep in proper lane or running off road	30			Swerved into inside lane later striking sign on sidewalk; OUI
22	3/25/14	Tuesday	3:07 PM	Rear-end	Daylight	Clear	Unknown	No Improper Driving	56	44		Vehicle was stopped at a green light and was rear-ended (<10 mph)
23	9/10/14	Wednesday	4:57 PM	Sideswipe, same direction	Daylight	Unknown	Unknown	Failure to keep in proper lane or running off road	51			Sideswiped trying to merge from LT lane; Hit and run
24	10/15/14	Wednesday	7:30 PM	Rear-end	Dark - lighted roadway	Clear	Unknown	Unknown				Stopped to let SB left-turning vehcile go resulting in rear end crash
25	11/23/14	Sunday	4:04 AM	Angle	Dark - lighted roadway	Unknown	Unknown	Unknown	24	54		Signals were on flash operation
26	12/19/14	Friday	8:45 PM	Rear-end	Dark - lighted roadway	Clear	Unknown	Distracted	35	18		Distracted and rear-ended vehicle

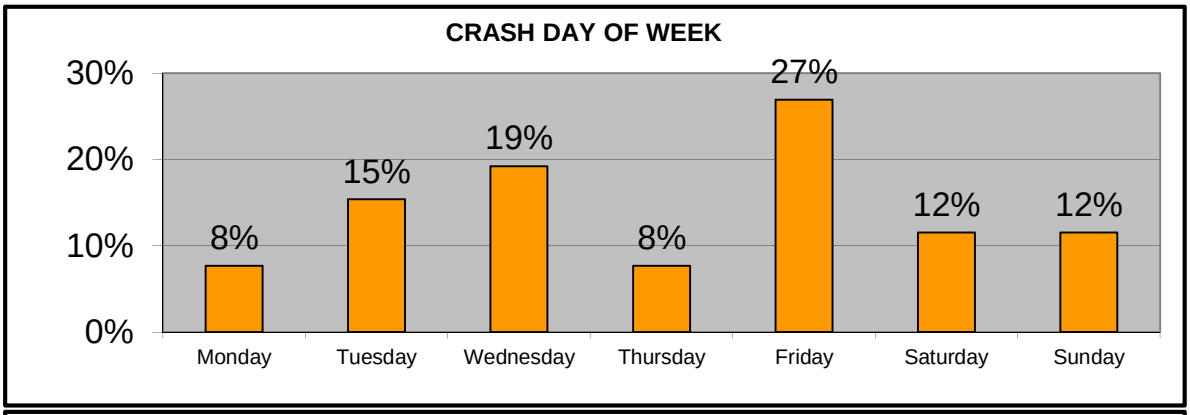
*Courtesy Crash - A term used to describe a crash that occurs subsequent to a non-involved mainline driver who gives the right of way, contrary to the rules of the road, to another driver.

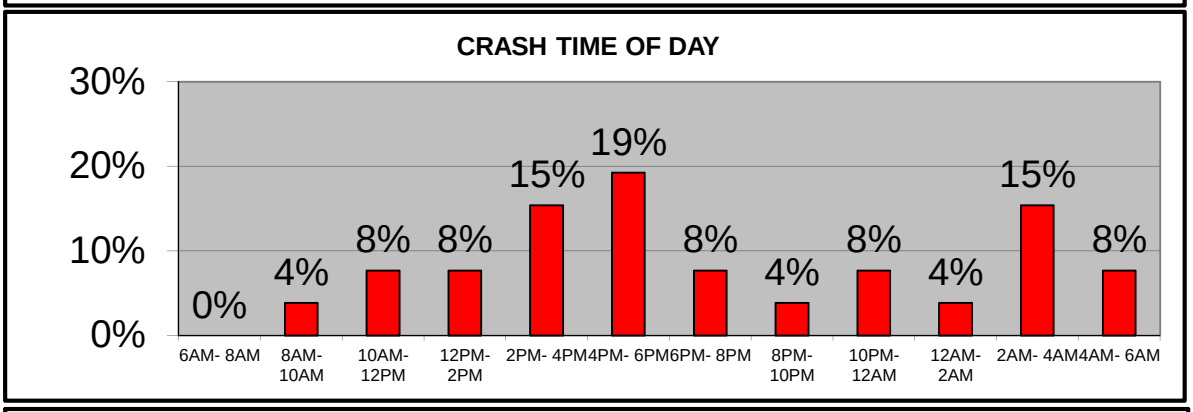
Summary based on Crash Reports obtained from the Boston Police Department

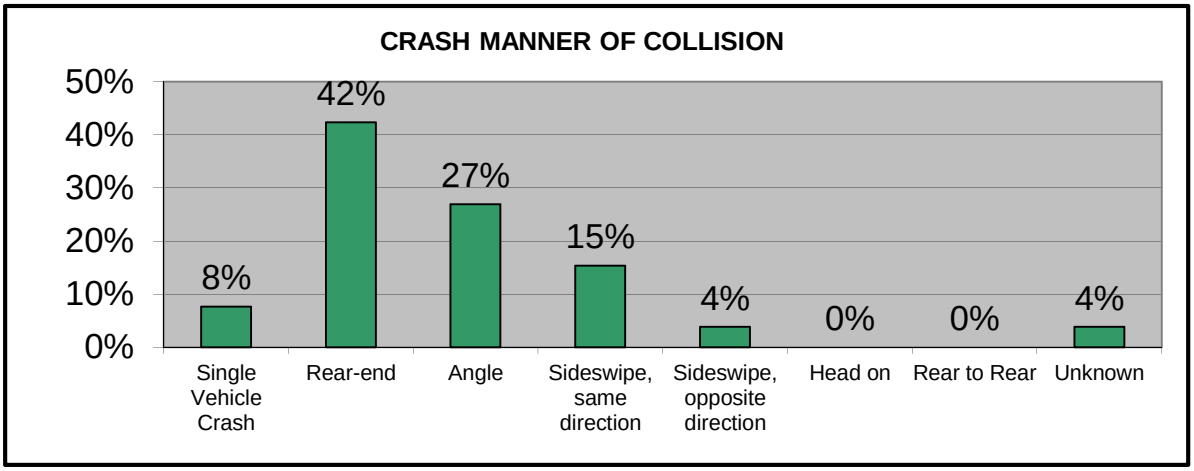
Crash Data Summary Tables and Charts

Warren Street at Quincy Street/Townsend Street, Boston, MA



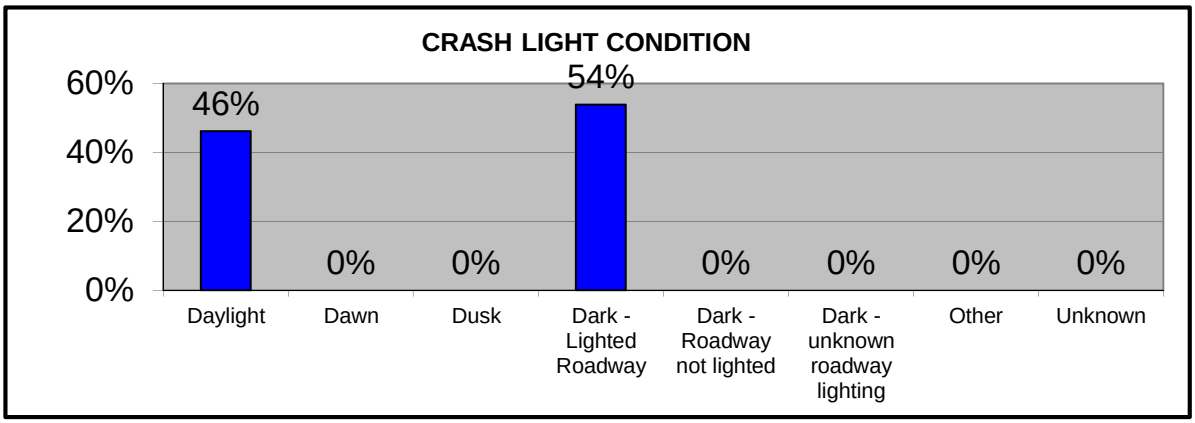


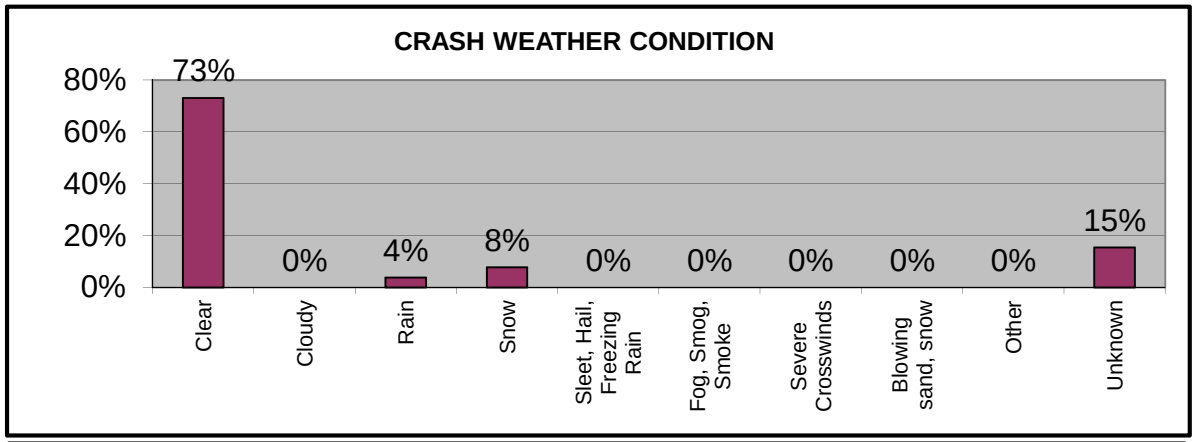


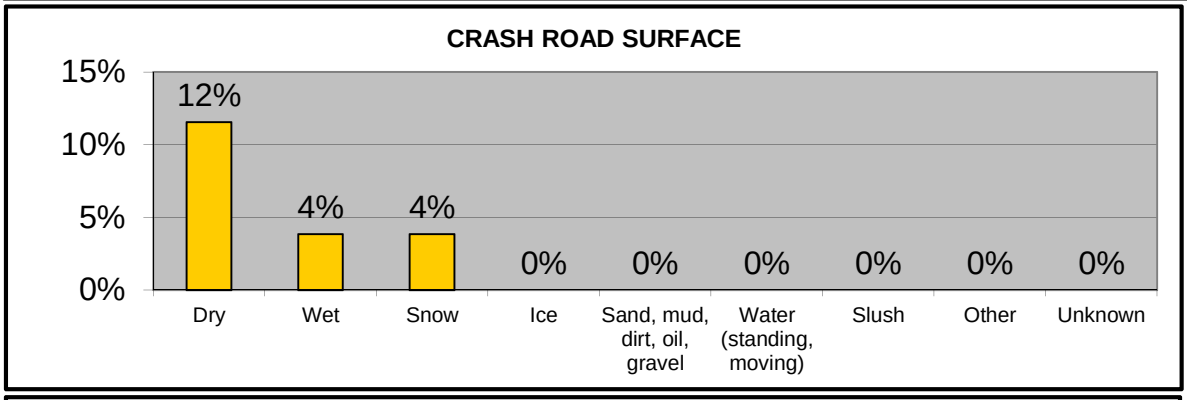


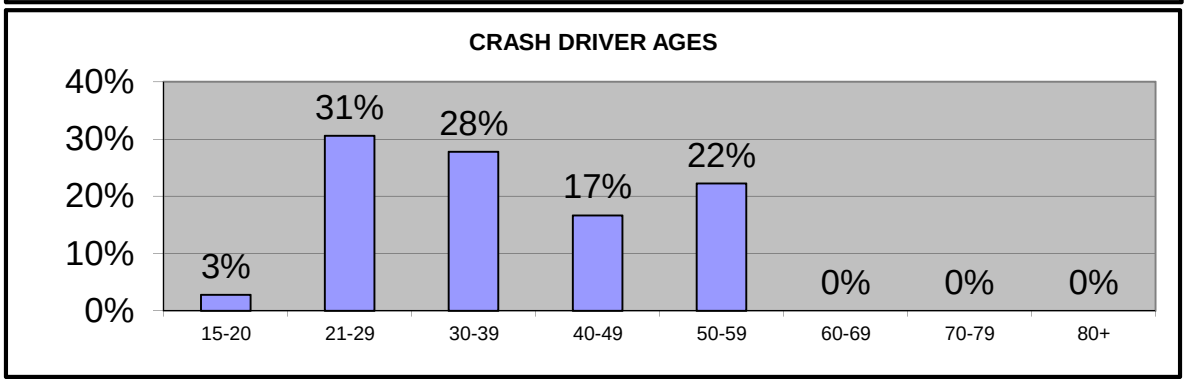
Crash Data Summary Tables and Charts

Warren Street at Quincy Street/Townsend Street, Boston, MA









Appendix D. Speed Regulations

NO. 193

THE COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF PUBLIC WORKS

SPECIAL REGULATION GOVERNING THE SPEED OF MOTOR VEHICLES ON BLUE HILL AVENUE, ROXBURY AND DORCHESTER, AND COLUMBUS AVENUE AND SEAVER STREET, ROXBURY, (CITY WAYS)

March 1, 1960

SPECIAL SPEED REGULATION NO. 193

Highway Location: BOSTON

Authority in Control: CITY OF BOSTON, TRAFFIC DEPARTMENT

Name of Highway: BLUE HILL AVENUE, ROXBURY AND DORCHESTER
COLUMBUS AVENUE, ROXBURY
SEAVER STREET, ROXBURY

In accordance with the provisions of Section 18 of Chapter 90 of the General Laws (Ter. Ed.), as amended by Section 2 of Chapter 564 of the Acts of 1948, the following Special Speed Regulation is hereby made by the City of Boston, Traffic Department, and shall be effective immediately upon compliance with the applicable provisions of the above-referenced Section 2.

The following designated speed limits are established at which motor vehicles may be operated in the areas described:

BLUE HILL AVENUE - SOUTHBOUND TRAFFIC

Beginning on Blue Hill Avenue at a point 420 feet south of the intersection of Washington Street,

southerly	0.18	miles	at	30	miles	per	hour
thence	0.56	"	"	35	"	"	"
"	0.20	"	"	30	"	"	"
"	0.53	"	"	35	"	"	"
"	0.25	"	"	25	"	"	"
"	0.65	"	"	35	"	"	"
"	0.35	"	"	30	"	"	"

ending at Fairway Street, Dorchester; the total distance being 2.72 miles.

BLUE HILL AVENUE - NORTHBOUND TRAFFIC

Beginning on Blue Hill Avenue at the south end of Babson Street at about 1558 Blue Hill Avenue,

northerly	0.25	miles	at	30	miles	per	hour
thence	0.62	"	"	35	"	"	"
"	0.33	"	"	25	"	"	"
"	0.47	"	"	35	"	"	"
"	0.20	"	"	30	"	"	"
"	0.33	"	"	35	"	"	"
"	0.50	"	"	30	"	"	"

ending at Washington Street, Roxbury; the total distance being 2.70 miles.

COLUMBUS AVENUE AND SEAVER STREET - Southeastbound traffic

Beginning on Columbus Avenue at Weld Avenue southeasterly and continuing onto Seaver Street,

southeasterly 0.52 miles at 30 miles per hour
" 0.46 " " 35 " " " and ending at Blue Hill Avenue, West Roxbury; the total distance being 0.98 miles.

COLUMBUS AVENUE AND SEAVER STREET - Northwestbound traffic

Beginning on Seaver Street at a point about 100 feet northwest of Blue Hill Avenue,

northwesterly 0.51 miles at 35 miles per hour
" 0.45 " and continuing onto Columbus Avenue at 30 miles per hour and ending at Weld Avenue, West Roxbury; the total distance being 0.96 miles.

Operation of a motor vehicle at a rate of speed in excess of these limits shall be prima facie evidence that such speed is greater than is reasonable and proper.

The provisions of this regulation shall not, however, abrogate in any sense Section 14 of Chapter 90.

The Department of Public Works and the Registrar of Motor Vehicles, acting jointly, do hereby certify in writing, after a public hearing that this regulation is consistent with the public interests.

Standard signs must be erected at the beginning of each zone.

DEPARTMENT OF PUBLIC WORKS

A. N. DiNatale
Commissioner

Fred B. Dole
Associate Commissioner

Alfred W. Devine
Deputy Registrar of Motor Vehicles
and Acting Registrar

George C. Toumpouras
Associate Commissioner